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May 7, 1914

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Drawn by
M. Wilder

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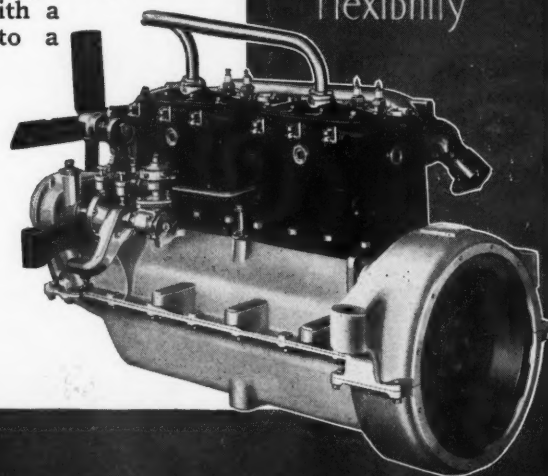
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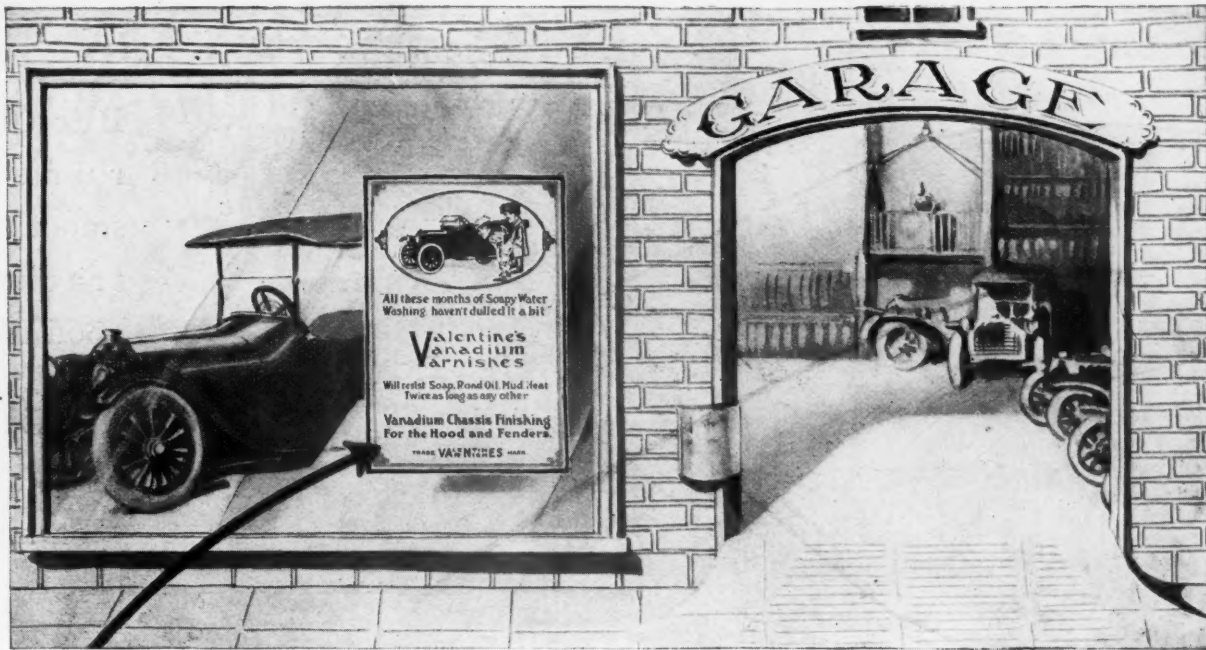
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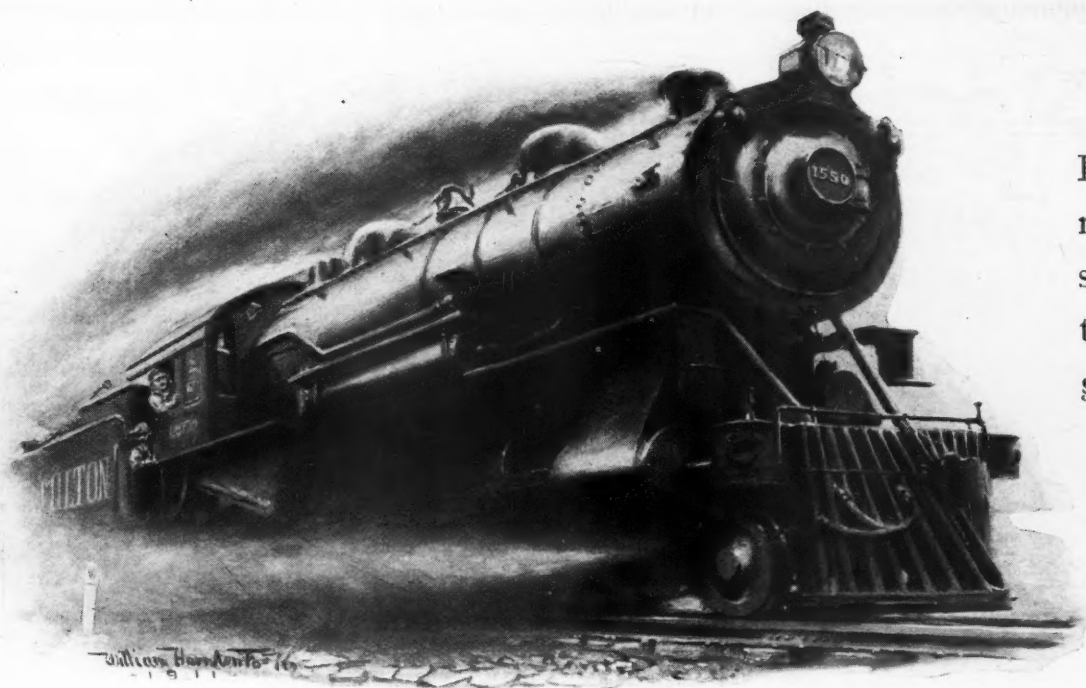
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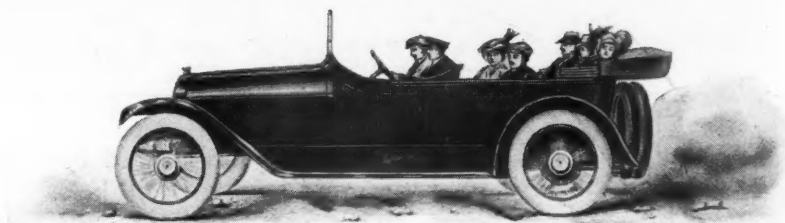


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Volume XXV

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The League of Amateur Advertisers

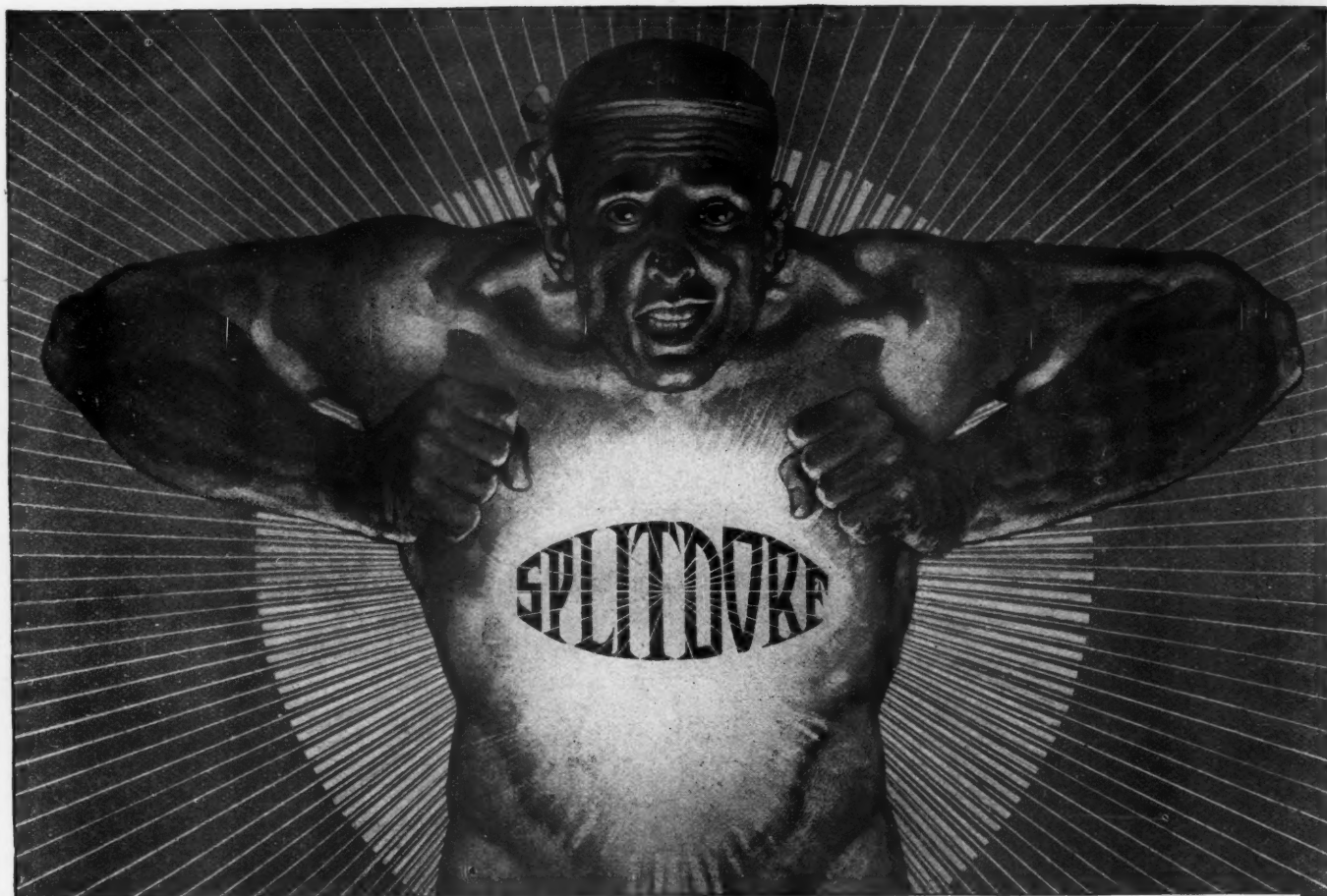
"Wait a minute, Jim. I want to look at this automobile Yes, I know it is the sixth machine I've walked around in seven blocks, but what's time to a New Yorker on Saturday afternoon? This nifty little mile-eater has an electric gear shift, and I want to ask the chauffeur how he likes it. Promised Pelly Amthorne I would.

"Gee! there's a new Jacksnipe with a center searchlight. How do you like the wire wheels, Jim? Look at those foxy inset lamps. Listen to that engine purr—two-cycle, I'll bet. Say, Fifth Avenue is certainly one great street. I could walk up and down here for a month. There's a new Battleax—wonder if those two-speed differentials are going to work.

"All right, Jim, I'll reluctantly shut up and focus my attention on the salmon-colored cloaks and green stockings for a while. I forgot that you don't take any deep, abiding interest in automobiles. All they mean to you is something to ride in, but to me they're as interesting as a new magazine. I've spent about four days in the salesrooms since I've been here and when I get home I'll be the center of breathless attention until I've passed around all the information I've dug up. I could go back without any information about the new shows, or the city campaign, but if I were to come back without a bale of automobile gossip I'd be fired for gross incompetency from the League of Amateur Advisers at Gayley's Garage."—From "The Auto Game in Homeburg," by George Fitch, in May issue of *The American Magazine*.

"League of Amateur Advertisers" they might as appropriately be called. They are of a type whose desire for knowledge about motor cars is insatiable. They are automobile "fans"—the comparatively small, well-informed 10% who influence the big, question-asking 90%. They read motor car papers from front cover to back—and then pass the good word along. They *multiply* your advertisement by the number of friends they have. 23,000 of them read—

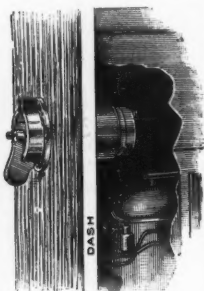
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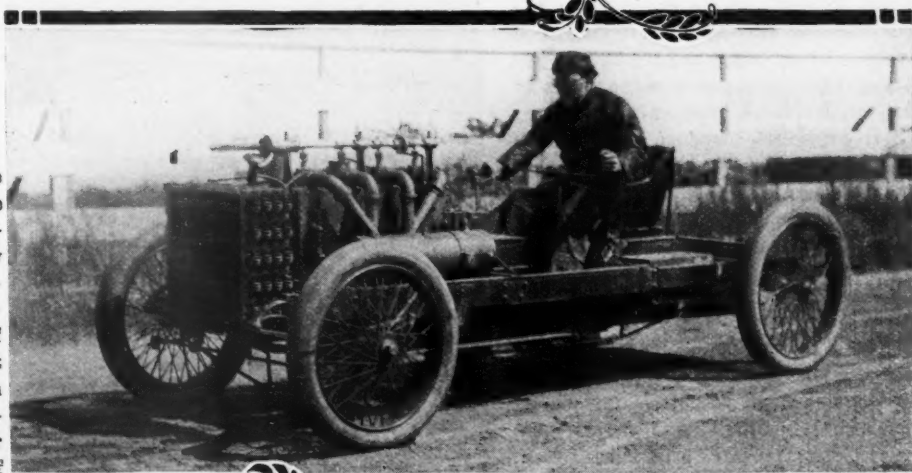
History-Making Racing Cars *What They Did and How They Did It*

By Darwin S. Hatch

EDITOR'S NOTE—Herewith is presented the first of a series of two articles which should prove most interesting to followers of racing. It deals entirely with the speed creations which have done so much to bring motoring into popular favor as a major sport, presenting facts about the old timers which will be new to the present generation, and in the case of the racing cars of recent years, recalling the facts that have made them famous. The present article necessarily deals with the veterans, the 999's, the Winton Bullets, the Whistling Billys, the Peerless Green Dragons and the Stanleys of other days, to which credit is due as pioneers in a sport that now ranks with the highest. In the issue of May 14 we will learn about the more modern creations. Doubtless, readers will recall other cars that may not be mentioned in this series, but Motor Age has endeavored to tear from the pages of history facts about racing cars that really did something.

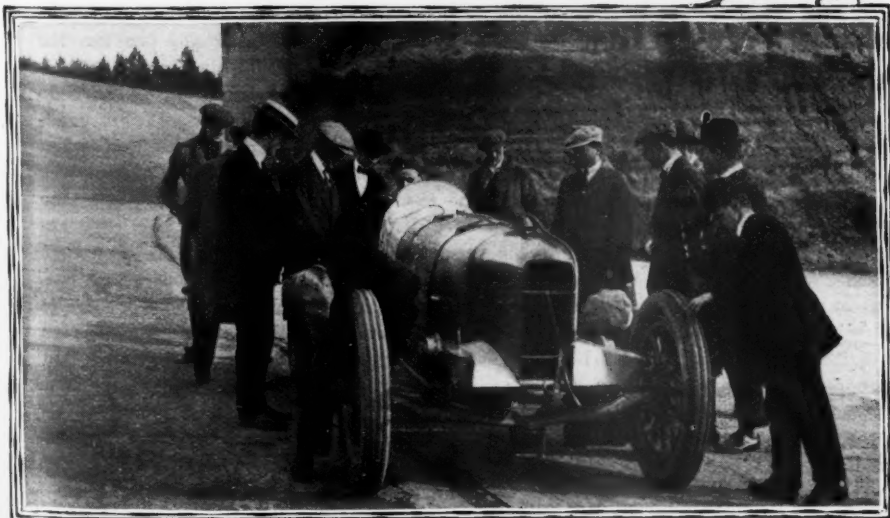
*Sing now, O muse! of days of old
When cars were slow but men as bold
As men who leer at Fate to-day
And jeer at pitfalls in the way:
Of heroes crowned by speed.*

BACK of the curtain that divides the Then from the Now, there is a rattle of gears, a throb of engines, a roar of exhausts—faint but reminiscent of new thrills experienced, new ambitions realized, new records made. Back of this curtain are shadows of strange monsters of steel and grimy men of courage in flight—monsters that wheezed and coughed in attempts to crowd a recalcitrant mile within a fleeting minute; men who wrote their names indelibly on the very fly leaf of motor racing history.



It's a far cry from the Ford 999 of 1902 to the English Sunbeam of 1913, but they represent the two extremes. The old 999 was one of our earliest champions, whereas the Sunbeam takes rank as one of the fastest cars of modern days. It holds the 1-hour record of 107 miles 1,672 yards and furthermore it actually has averaged 110.75 miles per hour in a race at Brooklands, surely honors enough to entitle it to claim the world's speed championship.

Lift this curtain, and your first impulse is to laugh. Compared with the feats of the present day on road and track, those early attempts to conquer Space and challenge Time are ludicrous. But look again. The cars of other days flash by on the Trail of Memory—the historic 999, the Winton Bullet, the Stanley Bug, the Green Dragon, the Gray Wolf, old Whistling Billy and the Fiat Cyclone. The race is run and the idols of Motor's morning pass in review—Marriott, Cedrino, Webb Jay,





It was in the Peerless Green Dragon that Barney Oldfield established his reputation as a dirt track champion. It was a four-cylinder built by Louis Moers and is said to have had the first underslung frame built in America. There was no gearset, a sliding clutch being used

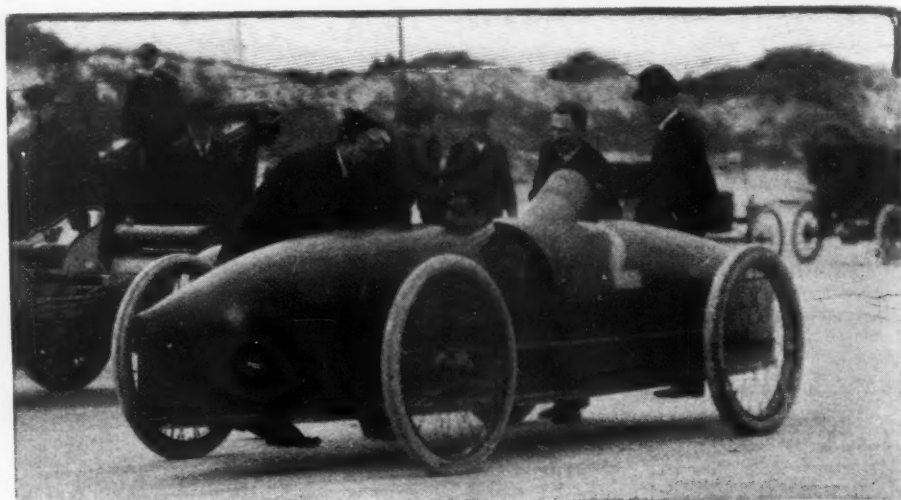
Barney Oldfield, W. K. Vanderbilt, Chevrolet and a host of others. Suppress the smile! Uncover! Here are drivers and cars that made history, cars that were built on dreams of success by ridiculed men who had no precedent to guide them.

Fame for a Day

Battered and bent, these graybeards of speed are cheered no more. They have given way before the grease-spattered creations of a new generation of builders. The crowds that once paid them vociferous homage now recount the achievements of dePalma's Mercedes, sponsored by Tragedy and Triumph at its christening; the Blitzen Benz, in which Bob Burman earned the title of speed king; the 300-horsepower Fiat that carried Duray over the sands of Ostend at a rate of 142.9 miles per hour; the twelve-cylinder Sunbeam, holder of the world's 1-hour record; the dependable Stutz at whose wheel Earl Cooper was crowned national champion; and the Jay-Eye-See, monster fire-spitter of the hippodrome circuit.

Many of the mechanical patriarchs that roared a menacing challenge at Brighton Beach and Daytona-Ormond and in the classic Gordon Bennetts of a decade or more ago, lie silent, forgotten, unhonored on junk heaps. Others, like the around-the-world Thomas, are prized as relics. Some, despite their age and years of faithful service, still respond to the foot of a new master when he steps upon the throttle.

Of the men who courted Fame at the steering wheels of these antiques, only a few retain their allegiance to the racing car. In the races held at the dawn of the new century, it was the rule rather than the exception that the designer and builder of the car was its driver and many of the makes of cars that are household words to-day made their first bid for popularity with their creators guiding them on uncertain and tortuous journeys. Henry Ford, Alexander Winton, Windsor T. White, Percy Owen, Edgar Apperson and F. E. Stanley, hailed as dare-devils in the early days of the sport, now control plants that grind out a profitable grist of motor cars annually. Other drivers of the glorious yesterdays are now active in the motor



In the early days at Ormond there was no disputing the speed supremacy of the Stanley steamer, driven by Marriott. It established the world's straightaway record of 28 1-5 seconds but it met its Waterloo in 1906 when Demogeot in the eight-cylinder Darracq defeated it in the 2-mile-a-minute race

car industry or its allied interests—Carl Fisher with his speedway and Prest-o-lite connections; Webb Jay with his accessories; Charles B. Shanks with the Class Journal Co.

Long a Popular Idol

Of all the drivers who became famous when racing in America was in its infancy, only one retains his prestige, only one continues to be a popular idol of the speed fans. That driver is Barney Oldfield—good-natured, cigar-chewing Barney Oldfield, the game's Peter Pan—whose checkered career is so interwoven with the history of the early speed cars in this country that a story of his experiences must include the triumphs of most of the older racing machines.

Oldfield's first experience, his entrance to motor car racing, was in 1902 with the original Ford 999. Before that time he was a bicycle rider and in the spring of 1902 Tom Cooper, an old-time bicycle champion racer, loaned him a motorcycle tandem. With this he was very successful in Salt Lake City and gained his first gasoline engine experience there. While he was in Salt Lake City, Cooper had formed some sort of a combination with Henry Ford, who had been dabbling at motor cars for 5 years previously. Coop-

er wrote Oldfield that he was building two racing cars of enormous power and on their completion expected to tour the country and give exhibition races.

Toward the end of the season when the cars were nearing completion, Oldfield went to Detroit as a mechanic and helper for Cooper and Ford. One car was painted red and the other yellow. The red one had Ford's name on the seat and the other one had Cooper's. The red one was finished first and taken out to the old Grosse Pointe 1-mile track for its first trial. The trial was a flat failure for the engine was "as hot as mother's cook stove," according to Oldfield, and it looked like Cooper and Ford had wasted

not only a lot of money but a great deal of time and energy as well.

Ford finally got disgusted with the machines and turned the red one over to a piano tuner in Detroit. Ford wanted to wash his hands of the whole affair and agreed to sell Cooper the two cars for the actual cash he had put in. In addition Cooper was to assume all outstanding indebtedness and was to pay for the machinery in the shop, which consisted of a drill press, lathe and emery wheel. Hence, Cooper practically was forced to buy Ford out before the latter would produce the red car, and help finish up the yellow one. When they were finished up in a crude way both Cooper and Oldfield were confident that they would run, so that when Carl Fisher and Earl Kiser, later driver of the Winton Bullet, promoted a race meet in Dayton, Ohio, the two cars appeared there and it was at this time that the yellow car got its name of 999.

Ford 999 Makes Debut

The two cars did not run any better at Dayton than they had at Grosse Pointe and they were shipped to Toledo, Ohio, where Cooper and Oldfield, together with "Spider" Huff, set to work to fix them up so that they could be entered in the race meet to be held at Grosse Pointe track,

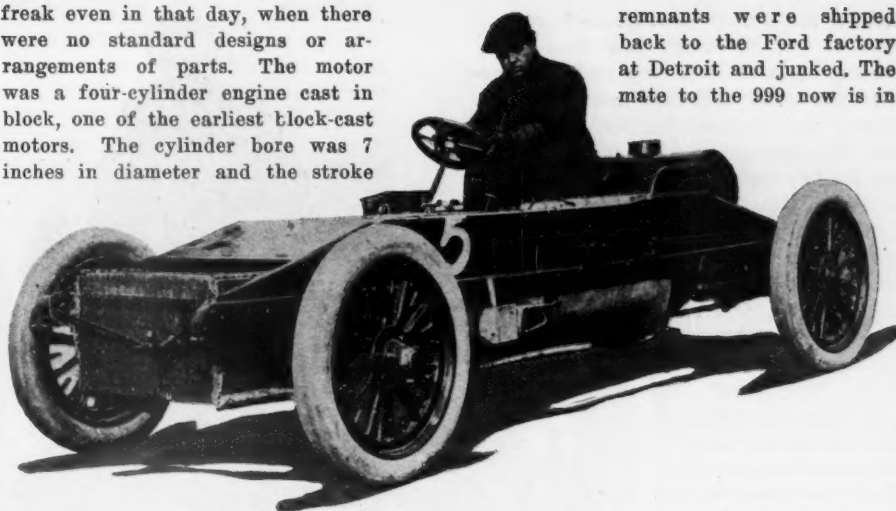
October, 1902, and in which Alexander Winton, Charles B. Shanks, Windsor T. White, Harry Harkness, and several others, who then were prominent in the sport, were to participate.

The cars were finished after many hours of night and day work and after trying them out one morning at 3 a. m. and finding that they actually ran, they were shipped to Detroit on the boat arriving there about 2 o'clock the morning of the race. Cooper went to bed, but Huff and Oldfield borrowed a horse that was used for pulling a lunch wagon, and just before daylight towed the 999 out of the residence portion of the city where the engine could be started without waking up the central police station.

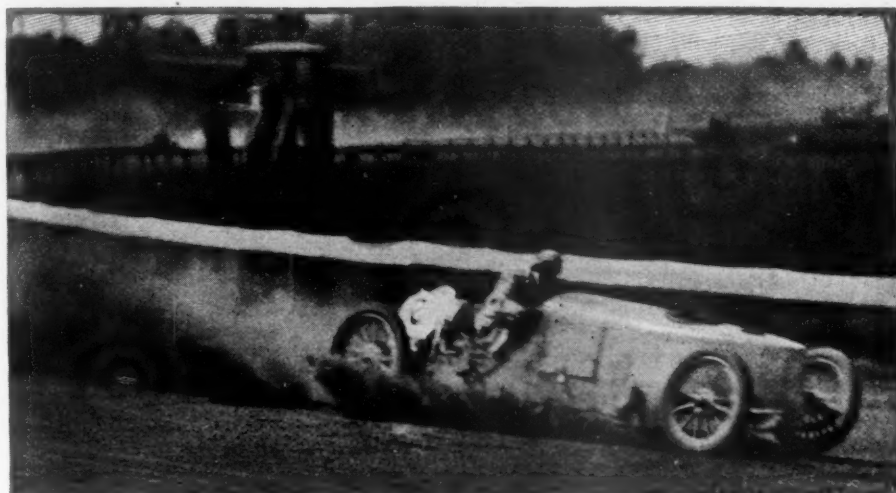
Up to this time Oldfield never had driven a car in spite of all the work he had been doing on them, never had ridden in a motor car but twice. On arrival at the

freak even in that day, when there were no standard designs or arrangements of parts. The motor was a four-cylinder engine cast in block, one of the earliest block-cast motors. The cylinder bore was 7 inches in diameter and the stroke

remnants were shipped back to the Ford factory at Detroit and junked. The mate to the 999 now is in



There were three Winton Bullets, but the one shown herewith was piloted by Earl Kiser, the former bicycle champion. Kiser lost a leg in an accident at Cleveland in 1906 driving this car. Shortly after the Winton company retired from racing, after contesting for several years



The White company also used to support racing and the Whistling Billy was its champion. The car was driven by Webb Jay and created many records. At Buffalo, within a week of the time of the Kiser accident, Jay ran off the track into a pond of water and was injured severely

track, Oldfield began to practice, and over the strenuous objections of Henry Ford the car was entered in a 5-mile event against Winton in his machine, Shanks in the Winton Pup, and a steamer called the Geneva. Oldfield won his first race, driving the 5-miles in 5 minutes, 28 seconds.

Oldfield and 999 Shine Together

With this auspicious beginning, Oldfield and the Ford 999 began their career together, and records fell in rapid succession. In December of that year this combination broke the world's record for both 1 mile and 5 miles over 1-mile dirt tracks and in June, 1903, they appeared at Indianapolis at a race meet promoted by Carl Fisher, doing a mile in less than 1 minute. Hence Indianapolis, in addition to having the finest speedway in America, has the distinction of having had the first mile under the minute on a 1-mile dirt track. On the following fourth of July Oldfield and the Ford went 10 miles in less than 10 minutes.

Mechanically, the old Ford 999 was a

was 7 inches. The inlet valves were automatic; there was no crankcase, the crankshaft revolving in the open; there was no transmission, except for an expanding friction clutch; it had no worm steering gear, or steering wheel. The steering gear was connected up direct to a vertical steering column which was turned by means of handle bars.

The machine had no differentials and had 34 by 4½ inch wire wheels. The radiator was in front of the car, was made of large horizontal tubes and originally was about the biggest thing on the car, as it extended from within 3 or 4 inches off the ground to somewhat above the engine. The exhaust valves were operated by an overhead camshaft driven by a bevel gear and vertical shaft and all gearing and mechanism was open. Later the high radiator was displaced by a more compact one.

This original 999 ended an eventful career at Milwaukee when it went through the fence and killed its driver, Frank Day. The car was completely wrecked and the

California and is owned by Dana Burke at Santa Monica. It has been remodeled to such an extent that it resembles the original 999 very slightly. Tom Cooper had set up a number of records with this car. He formerly was a bicycle racing champion and was killed in 1906 while driving through Central Park, New York.

There was one predecessor of the Ford 999. It was driven by Henry Ford who signalized his first appearance as a racing driver by being beaten by Alexander Winton in the Winton Bullet at Grosse Pointe. He was hailed in Motor Age of October 17, 1901, as "the new Detroit phenomenon." The car was credited with 40 horsepower and Ford said he had made a ½ mile in 26 seconds in a preliminary trial.

Three Winton Bullets

There were three Winton Bullets which were driven at various times by Alexander Winton, Charles B. Shanks, Barney Oldfield and later by E. H. Kiser. The Bullet No. 1 made a speed of 1 mile in 1 minute 6 4/5 seconds at Detroit in October, 1901, on a circular track. This had a four-cylinder engine with vertical cylinders of 6 by 1 inch bore and stroke; it had shaft-drive with a reduction of 1.057 to 1. It had a wheelbase of 100 inches and weighed 2,000 pounds. The tires were 32 by 4 3/4 inches.

The Winton Bullet No. 2 had two official records to its credit, one made at Cleveland in August, 1904, of 1 mile in 52 4/5 seconds and in January of the same year at Ormond Beach the car made a mile in 43 seconds. This had an eight-cylinder engine with its 5 3/8 by 6-inch cylinders arranged horizontally. In other respects it was about the same as the No. 1, except for the wheelbase, which was 112 inches and the weight of 2,160 pounds.

The Bullet No. 2 was made by coupling two of the Baby Bullet's engines together. It had no transmission, but started with a friction expanding clutch. The reason Winton did not put in a gearset was to save weight, as in order to com-

pete in the Gordon Bennett in Europe in 1903 it had to weigh less than 2,204 pounds. This car was very fast for those days and under Oldfield's handling, when Winton retired after the Gordon Bennett race, the former broke all the records he previously had made with the 999. The 1-mile world's championship of 43 seconds at Ormond-Daytona mentioned above, was captured by Oldfield, defeating such men as W. K. Vanderbilt Jr. and Sam. B. Stevens, both of them in high-powered Mercedes cars, which cost them something like \$19,000 each, it is said.

The No. 3 Bullet did not have the speed of its predecessor, although it had an official reported speed of 1 mile in 59 seconds taken at Cleveland on a circular track in September, 1903. It had four cylinders set horizontally, 5 3/8 inches by 6. Its wheelbase was 100 inches and its weight 1,850. This car was strictly up-to-date for those times, having a two-speed gearset, differential, and a steering worm. Later it was the Baby Bullet.

Peerless Green Dragon

Another car which won fame in the early days of the century owned its existence to Oldfield. This was the Peerless Green Dragon. In 1904, Oldfield went with the Peerless company and Louis P. Mooers built him a car which was christened the Green Dragon. It had great success during 1904 and 1905 until it met its Waterloo at St. Louis, when it went through the fence and was completely wrecked. It was a four-cylinder car, 6 by 6 inches in size with the cylinders cast separately and of the T-head type.

After this car was wrecked, Mooers built another car, which Oldfield also called the Green Dragon, and which was the first



To look at Carl Fisher now no one would imagine that the millionaire sportsman and president of the Indianapolis speedway ever was a racing man. But he was and he was a good one, too. He used to race a Premier and follow the dirt track circuit

underslung frame built in America, if not in the world. The engine was cast in one block, 5 3/4 by 5 3/4 inches. The valves were in the head, there was no gearset, but it had a sliding clutch and a pointed vertical tube radiator whose appearance suggested its name. Oldfield drove this car for 4 years and the combination broke many world's records.

In its day, the Stanley steamer, affectionally known as "The Bug," was regarded as the fastest thing on wheels. It was sent to the Ormond Beach meet in January, 1906, where Marriott drove it, putting the world's mile straightaway

record at 28 1/5 seconds. It was credited with 50 horsepower and the steam was superheated by the Stanley system to a temperature of 700 degrees.

The motor was a two-cylinder double-acting engine with cylinders 4 1/2 by 6 inches. It was claimed that with the engine running at 700 r. p. m., it was capable of developing over 100 horsepower. The valve gear was of the Stephenson link style, which is used today on locomotives. The weight of the machine exclusive of supplies was approximately 1,650 pounds and the wheelbase was 100 inches, and the tread only 54 inches. The tires were 3 inches in the front and 3 1/2 in the rear.

It was steered by cross lever instead of a steering wheel. The frame was entirely of wood, hung on four elliptic springs inside of the body. The bottom of the car was perfectly smooth and the hood made of wood with



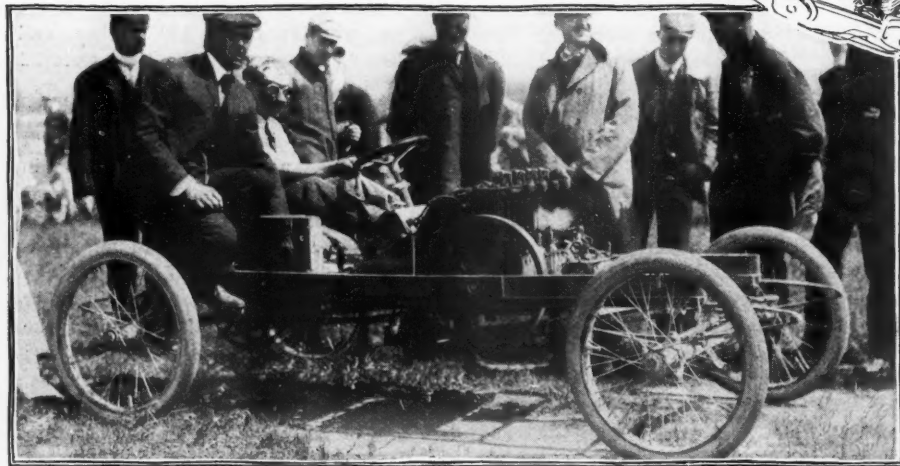
Here's a real old timer, a foreign production. It is an old Panhard which ran in the 1903 Gordon Bennett and also was third in the Paris to Madrid race. At the wheel is Fournier

an inverted boat appearance, having a round turtle back body with sharp prow and stern, the only opening being for the driver's shoulders. This is one of the earliest of the consistent efforts to reduce wind resistance.

Stanley Bug a Favorite

Marriott was the foreman of the repair department at the Stanley factory. A year later Marriott brought to Ormond a new Stanley, which was said to be faster than the first one. In a record drive, however, going at what was estimated to be better than 100 miles an hour, the car overturned and was wrecked, though Marriott escaped serious injury.

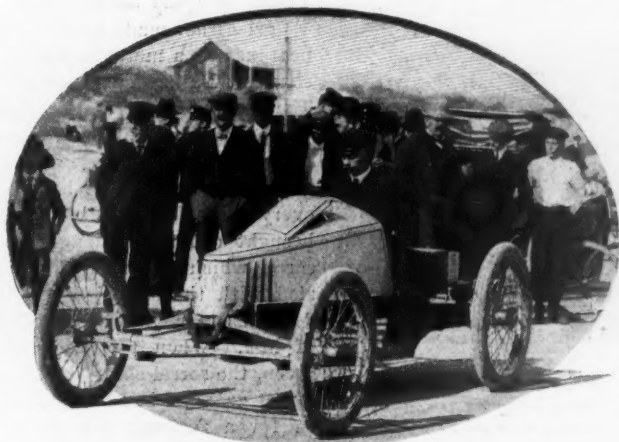
At this meet when Marriott made his record there appeared another Ford racing machine. This was a six-cylinder car which practically was all engine. It was driven by Frank Kulick and in its trial for the mile record covered the distance in 40 seconds. It was credited with 105 horsepower and the six cylinders separately



The Franklin used to race, too, due to the enthusiasm of E. H. R. Green, son of Hetty Green, over the air-cooling proposition. Colonel Green maintained a racing stable and the Franklin Skeleton was prominent at many of the dirt track meets, with Jesse Illington at the wheel

cast engine occupied nearly the whole frame between the front and rear axles. The driving shaft was less than 18 inches in length and the driver held a precarious position on a seat on the extension of the frame at the rear of the rear wheels. So uncertain was the driver's position that stirrups were arranged for his feet to prevent him falling over backwards. The car had a long, pointed radiator, no gearset, and wire wheels.

This 1906 meet at Ormond was the scene also of the breaking of another record. It saw the first time a human being ever covered 2 miles in the space of 60 seconds. The car which accomplished this was the eight-cylinder Darracq and the driver was Victor M. Demogeot. The car originally was to have been driven by Hemery but because of difficulties with the officials over weighing in, Hemery attempted to withdraw all of his cars. But by placing



The Packard Gray Wolf was the standard bearer of the Packard company when that concern dabbled in racing. It established several long distance records on American dirt tracks

a guard about the big one and getting an eleventh-hour substitute for the deposed Darracq pilot Hemery was outwitted and the car covered the 2 miles in 58 4/5 seconds, winning the 2-mile-a-minute speed crown. Demogeot was not known to be much of a driver as he was only Hemery's mechanic. It looked like sure defeat to stack him up against Marriott in the Stanley steamer, which was the holder of the mile straightaway record at that time.

Eight-Cylinder Darracq

Details as to the construction of the car are meager. It had an eight-cylinder engine, the cylinders cast in pairs and set in the form of a V with the apex of the V pointing to the ground. It was credited with 200 horsepower, wire wheels were used and the springs were semi-elliptic in the rear as well as in front. As was the case in most of the cars of that day, the driver was perched very high and at what would seem to be an uncomfortable



One of Oldfield's mounts was the Winton Bullet and herewith is shown the veteran at the wheel of this pioneer. The motor was an eight-cylinder, made by coupling two engines together. This car competed in the Gordon Bennett

position, especially for high-speed work.

"Whistling Billy" was the name of the White steamer that Webb Jay used to drive in 1905. It created a 1-mile record at Morris park, doing a mile in 48 3/5 seconds, and won the Thomas cup for the Chicago Automobile Club against the big Fiat driven by Chevrolet and Walter Christie's 120-horsepower double-engined, direct-drive car, both of which were running under the Automobile Club of America's colors. Owing to the peculiar construction of the track, which eliminated one or two turns, the mile record did not stand.

This was in July, and a month later the racing career of the White com-

pany, Whistling Billy and Webb Jay was ended simultaneously when the car went through the fence at Buffalo, August, 23, almost killing Jay. This caused the retirement from racing of one of the greatest drivers of the early days.

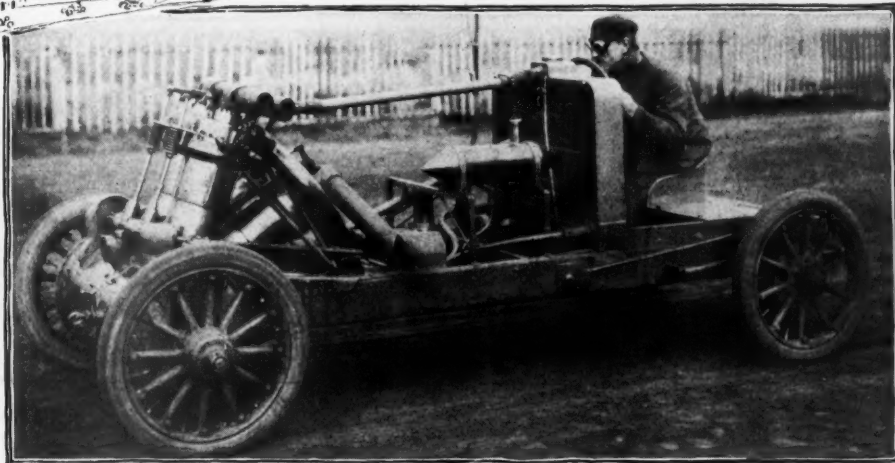
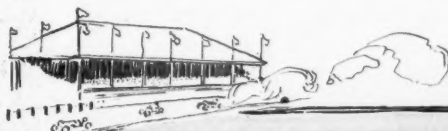
Alfred G. Vanderbilt's special racing car was the greatest gold brick that ever was perpetrated in this line. Vanderbilt had the speed fever following the success on the mile record by his brother, W. K. Vanderbilt, and decided to build a car that would beat everything at the Ormond meet. He employed an Italian engineer, Sartori, and one or two other foreign experts, who promised unlimited speed. He is said to have spent \$60,000 or \$70,000 on it and it was taken to the Ormond meet for the January

trial in 1906 at the time the Stanley and the Darracq made their records. However, it never got to the tape. It was credited with 250 horsepower, although like many of the others of that day it probably was considerably over-rated.

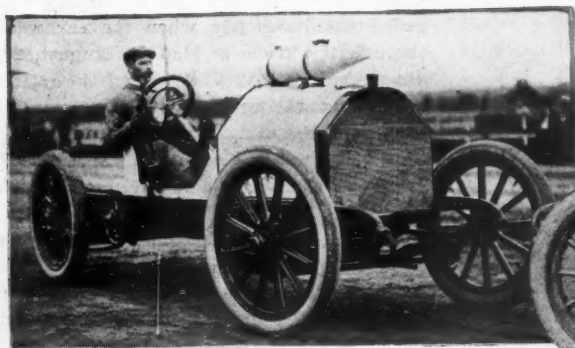
Christie's Front Drivers

One of the oddest and oldest of racing creations was the Christie, and still is for that matter, one of them now being driven by Oldfield, who created the present 1-mile dirt track record with it at Bakersfield, Cal., last year. The Christie is noted for being a front-drive car and was first exploited by its designer, Walter Christie, who declared that it was easier to pull a car than push it. The feature of the car was that the crankshaft of the engine formed the front axle.

Christie built it in three forms, the two latter, a four-cylinder and an eight-cylinder, both of the V-type. The eight-cylinder car first appeared at the 1905 meet at Morris Park. The four-cylinder was the car used mostly. Its real speed is not known but it is declared to be sensational indeed. Christie drove it at the first In-



The Christie front-driver still is in existence. It was designed by Walter Christie and driven by him. The designer contended that it was easier to pull than push. Oldfield now owns it and in it he established the present dirt track mile record



Alfred Vanderbilt at one time had the racing fever, brought on by the success of his brother, W. K., Jr. Alfred spent a fortune on a car that was to beat everything at Ormond



Louis Mooers was a prominent factor in the early days of racing, both as designer and driver. Here's a Peerless he built for the Gordon Bennett cup race the year that classic was run in Ireland and won by Janetzy in the Mercedes

dianapolis meet and since then the old car has been campaigned all over the country. It is now owned by Barney Oldfield.

The original car appeared at Ormond beach in 1904, when it scored 1 mile in 1 minute. The engine had 30 horsepower and the car weighed 1,272 pounds, but was rebuilt during the summer of 1904 so that it showed 40 horsepower and weighed 25 pounds less than before. In this car the engine was a four-cylinder vertical, one casting forming the front of the machine and supporting the full weight of the engine on the axle. The steering also was on the front wheels.

The air-cooled Premier was notable chiefly from the fact that its pilot was Carl Fisher. The engine was a four-cylinder vertical type and the car was campaigned in 1903 and 1904 about the time that Cedrino, Oldfield, Chevrolet, Jay and Kiser were running around the dirt tracks. Fisher turned up at Ormond beach with his car but did not make any great showing. One

peculiarity of the engine was that it was entirely open, the valve timing gears and the magneto drive and so on were not inclosed by a housing of any sort.



The White used to bid for honors at Ormond in the days when steam was faster than gasoline. The car shown herewith is one that Webb Jay drove over the Florida sands before the Whistling Billy

This was one of the first cars in America to have a magneto, which was driven by chain from the front end of the engine. The wheelbase was very short, the en-

gine taking up most of the space between front and rear axles. There were no springs at the rear, but the main frame was hung at the front on a cross spring and the engine bolted directly to it. The gears were shifted by a handle like that of a street-car controller.

Fisher and the Sorrel

Carl Fisher made his first appearance as a motor speed merchant at Dallas, Texas, in 1901. The chief feature of the meet was a 4-mile relay race in which Fisher on a motorcycle was to go against a different horse at every mile. The first horse brought out was a long-legged sorrel which seemed to be puzzled with the situation and in doubt as to what was expected of him. When the word was given, the sorrel sprang away at a fast gait and had Fisher beaten for a furlong, then he noticed that there were no other horses running and it seemed to occur to him that there probably had been a bad start. He stopped, looked over the field and, in spite of the desperate efforts of his jockey, turned around and returned to the post to look for the other horses.

Two other horses then were started and beat the machine a good distance. The sorrel again was started and got off well, but slowed up at the quarter to see what was the matter. He caught a glimpse of the motor and it finally occurred to him what was expected. The sorrel's indecision was a lucky circumstance for the motorcyclist for when the horse did get started he made a hot race and was beaten by only three lengths.

The Gordon Bennett cup races have made famous a number of cars and drivers. One of these is the Mors which, driven by Gabriel, made a showing at the 1903 Gordon Bennett and finished third in the Paris-to-Madrid race. The 1903 Gordon Bennett in Ireland was won by the Mercedes with Janetzy driving. On account of the burning of the Daimler factory in Germany shortly before the race,



The Maxwell-Briscoe company at one time thought that an eight-cylinder car would be faster than a four and built such a machine for the Vanderbilt cup race. However, it never got into that speed battle, although it caused much talk at the time it was sprung on the public

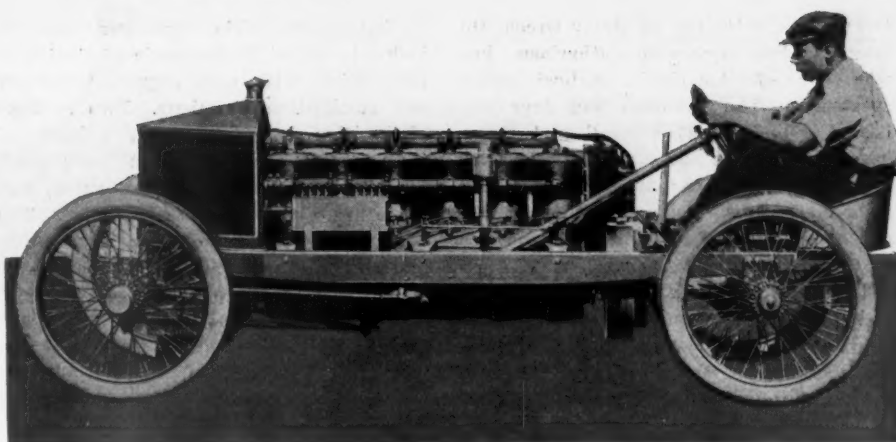
the 90-horsepower Mercedes, built especially for the race, were destroyed so Janetzky had to drive a 60-horsepower machine. This had a four-cylinder motor of 5.46 by 5.85 inches. The motor was remarkable chiefly for its inlet valves, which were fitted directly into the top of the cylinder heads and had three separate and distinct seats, so that the area of the combined opening would be equal to a single-seated valve of 8 inches diameter.

Water was circulated through a honeycomb radiator by a centrifugal pump and the mechanism which controlled the change-speed gear was operated by a cam in the gearcase, so that it could be rotated by the backward and forward movement of the controlling lever. Both front and rear axles were of I-beam section. This was remarkable in those days as it was about the first to employ the I-beam type of front axle. The motor was controlled by regulating the lift of the inlet valves through a lever corresponding to the present day throttle on the steering wheel.

Packard Gray Wolf

The Packard Gray Wolf was built during the year 1902 and was raced in 1903 and 1904. Its exterior appearance was quite suggestive of its name. It is a very light car with a sloping hood which came to a point just over the cross-spring which formed the front suspension. The radiator was a series of tubes and fins along the bottom of the hood on either side. The front axle was round section and wire wheels were used. The motor had four cylinders, 43/16 by 5 inches and was rated at 24 horsepower. A significant fact about this car was the employment even at that early day of the Packard two-unit construction, the motor and clutch under the hood and the gearset on the rear axle.

American cars did not make any great showing in the 1903 Gordon Bennett race which took place in Ireland. There were



Frank Kulick used to drive this six-cylinder Ford, which had a 105-horsepower rating. The driving shaft was less than 18 inches in length and the driver was perched on a seat on the extension of the frame, being held there by means of stirrups. It is said that this big Ford covered a mile in 40 seconds

three cars that won the preliminary elimination trial in America. Two of these were Wintons and the other was Mooers' Peerless. Alexander Winton drove the eight-cylinder Winton Bullet, which has been described. Percy Owen drove the four-cylinder Winton, similar in many re-

tor, motor, gear box and rear axle. The carburetor had a small hand-wheel adjustment within easy reach of the operator. The ignition system consisted of a single induction coil and storage battery. The spark plugs projected into a narrow aluminum box on the left side of the car.

The flywheel weighed 125 pounds and the motor was rated at 40 horsepower, which was a conservative estimate.

The wheels were 32 inches in diameter, with 4-inch Goodrich tires. The front axle was dropped and the springs mounted on top, while the rear springs were hung below the axle. The frame was of wood with 1/8

inch steel sheathing. The car had two speeds forward and reverse, with a propeller shaft connected with a bevel gear drive on the rear axle. On the high speed the drive was direct. The wheelbase was 8 feet 6 inches.

Franklin Skeleton

One of the pioneers of racing in America was the four-cylinder Franklin Skeleton. It was campaigned by E. H. R.

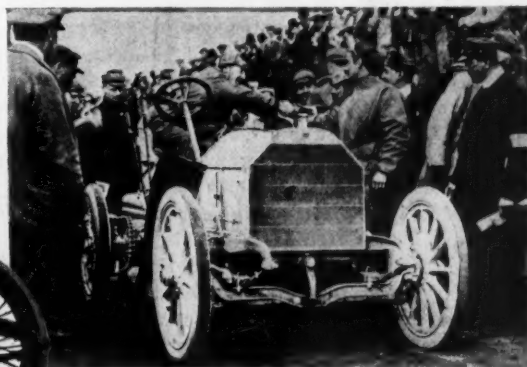


Here's the old Ford 999 disguised by means of a real streamline body and disked wheels. In appearance it greatly resembles the Stanley steamer, which was one of its great rivals. This particular 999 though was not as much in the limelight as the others

spects to the larger car, except that it had only four cylinders and weighed only 1,450 pounds. The cylinders were 5 by 6 inches placed horizontally across the center of the frame of the car with the cylinder heads projecting beyond the side. The cylinders were cast iron with aluminum water jackets. There were no cross braces on the frame, the side bars being connected and held together by the radia-



Here's the Darracq in which Victor Hemery won the second Vanderbilt cup race. It makes an interesting study and shows the trend of design in those early days. Note the short wheelbase and also note how high the driver is from the ground



Camille Jenatzky, the Belgian, now dead, used to drive this old Mercedes, which belongs in the honor class, having won the 1903 Gordon Bennett

Green, who is the son of Hetty Green. He long ago lost his racing enthusiasm, but was one of America's earliest motor sportsmen. The Franklin had four air-cooled cylinders set vertical and cross-wise in the frame and just about the middle of the frame, with the flywheel at the right end of the crankcase. The car was one of the lightest of the racing machines of the old days.

The Peerless which was built by Louis Mooers for the Gordon Bennett race in Ireland in 1903 and driven by him was somewhat similar to Oldfield's Green Dragon. It had a four-cylinder vertical motor of

80 horsepower. The cylinders were 6 inches bore and stroke, made of steel 5/16 inch thick with cast iron waterjackets and combustion chambers. Two systems of ignition were employed, neither of them magneto. One was a jump-spark placed directly over the inlet valve, and the other a make-and-break igniter. The car had a sliding gearset and a governor in front of the engine. The radiator was one of the features of the car and was made of copper tubes 1/2 inch in diameter running along the pointed body from the rear axle to the nose.

(To be Concluded)

Engineers Learn Much from Racing

Porter Tells of Sport's Effect on Manufacturing

NEW YORK, Apr. 30—At the regular monthly meeting of the metropolitan section of the Society of Automobile Engineers at the Automobile Club of America "Racing and Its Effect on Manufacturing" was the topic of discussion. Finley R. Porter, who designed the Mercer cars which have won numerous events during the past few years, read the paper on this subject. The paper was illustrated by lantern slides and moving pictures.

Mr. Porter prefaced his remarks with a review of the development of the racing car from the beginning down to the present time beginning with the Benz and Daimler machines of the early days. Lantern slides showing the leading cars of each succeeding year were thrown on the screen.

The actual results obtained in touring and racing are identical in quality but differ in degree, the results from racing being magnified, said Porter. Defects that might not show in a touring car in several years of ordinary running will become apparent in a racing car in a day.

Mr. Porter stated that in his experience with a T-head motor in Mercer racing machines he had found out many valuable points that could be used to advantage in ordinary pleasure-car motor design. For instance, it was found with the high mean effective pressures obtained in the racing motors, these amounting to 100 pounds, that there was a tendency for the walls of the cylinders to weave, with the result that they would in some cases show signs of fatigue. In a touring car it might be years before trouble from this source might show up. The result was that the factor of safety was greatly increased so that the working stress is not over 5,000 pounds per square inch in a material that tests 34,000 pounds.

Another lesson that racing has taught is the necessity of straightline drive and a low center of gravity, the former reducing the wear on the universals and increasing the efficiency of the transmission of the power and the latter making for greater safety.

A low ratio of unsprung to sprung weight is another result of racing experience, this feature enabling the car to hold the road better at high speeds. This is important in a touring car from a standpoint of safety. Furthermore, a low ratio of unsprung weight means a smoother riding car, less tire slippage and, therefore, increased mileage.

On the Mercer machines the ratio of unsprung to sprung weight on the front wheels is 25 per cent and on the rear wheels 35 per cent, and it has been found that with the reduction of these ratios to their present values the amount of tire slippage has been reduced from 5 per cent to 1 to 1.5 per cent.

Where a shaft-drive construction is used without radius rods the driving stress must be taken by the springs, and as it is usual to shackle the springs at the rear the driving is done through the front. Thus the spring members are in compression and tend to buckle. Heavier spring members must be employed with this construction than are necessary when the shackles are at the front and the fixed ends are at the rear. It has been demonstrated on the recent Mercer racing models that springs of the latter type give better results as they may be made lighter. There is less strain on them, due to the fact that the spring members are in tension.

Another important development directly traceable to racing is the streamline body. The form of the hood and body on the racing car is just as important as the design of the motor, and the present wind-cutting designs for racing cars are reflected in the touring cars of today.

Probably the most important result of the influence of the racing car on the pleasure car construction is in the use of fatigue-resisting metals, the lessons learned from racing reducing the upkeep of touring cars considerably.

After Mr. Porter finished the paper several questions were asked him concerning the details of the Mercer machines. In reply to a query as to the weight of the motor per horsepower of the Mercer that

won the grand prize race he stated that the motor weighed 782 pounds and that it developed 150 horsepower. Therefore, its weight per horsepower is 5.21.

The question of wire wheels was brought up and Porter stated that the saving in weight was small but that there was less mass concentrated at the rim and more at the hub, the result being that the gyroscopic action of the wire construction is considerably less.

TEACHING CAUTION TO CHILDREN

Indianapolis, Ind., May 4—School authorities of the city are giving a great deal of attention to the traffic problem in regard to the safety of school children in the streets. The Indianapolis board of school commissioners is following closely a program outlined by the Indianapolis Chamber of Commerce and the Hoosier Motor Club, which have been working together in educating the public.

At the request of these two organizations, almost 60,000 copies of a series of questions and answers relating to traffic have been distributed among school children. In addition each teacher sets aside an hour a month in which children are given a special lesson on how to conduct themselves in the streets with a view to escaping injury.

At one or two of the larger school buildings, traffic policemen have been assigned to instruct the children how to cross streets with a view to avoiding accidents. The Indianapolis Chamber of Commerce has set aside \$300 to be used in a campaign of traffic education. The Hoosier Motor Club has been given space in local newspapers in which short, snappy articles relating to traffic appear weekly.

ONE-WAY STREETS FOR ST. LOUIS

St. Louis, Mo., May 4—St. Louis will give the one-way street system a trial, beginning May 10. Assistant Street Commissioner Charles L. Laxton will be in charge of the new regulations, which were framed this week by several traffic experts who have made a study of St. Louis' congestion of traffic in the downtown district.

A close observation of conditions showed that Sixth street was one of the busiest downtown lanes and that the preponderance of traffic on that street moved southward, therefore the street will be made a southbound street. Seventh street will be for northbound vehicles exclusively. These two streets for the present will be the only one-way lanes, but the alleyways in a district bounded on the north by Washington avenue, on the south by Walnut street, by the levee on the east and by Twelfth street on the west—an area of about thirty blocks—will be for traffic in one direction. The north and south alleys will be used for the northern traffic, while in the east and west alleys traffic must move in the westerly direction.

The east side of the court house at Fourth, Market and Chestnut streets will be widened 15 feet and this square then will be the downtown parking territory, relieving the congestion which usually prevailed on Fourth street from Washington avenue to Walnut street, a stretch of eight blocks. The one-way system will be in order only from 7 in the morning until the same hour at night.

At Twelfth street and Locust, the busiest intersecting corner in St. Louis, where, by actual count, 973 motor cars pass each hour, safety lanes have been maintained. Motor cars coming south or north on Twelfth street, the city's widest thoroughfare, use the center of the street, while the vehicles intending to go either east or west on Locust street must hug the curb. A lane is set aside for the pedestrian next to the street car tracks.

INDIANA TOUR ABANDONED

Indianapolis, Ind., May 4—It has been decided definitely by the Indiana Automobile Manufacturers' Association that it will abandon the tour it had expected to make beginning July 1. The association has been making summer tours annually, but there are a number of reasons why one will not be undertaken this summer. There is some talk of a fall tour, but this has not been decided one way or another.

A meeting of the association was held here last week, at which the plans were gone over carefully. There were two routes under consideration, one of which would have terminated in Texas and the other in Nebraska. It was decided the first route was impractical because of heat, bad roads and rain and that the second would be impractical because the territory has been covered so thoroughly by the association.

If a fall tour is given, it probably will be to Texas or Cuba. Should a trip to Cuba be decided upon, the route would lie through Kentucky, Tennessee, Georgia and Florida and ship from Key West to Havana.

NEW YORK STARTS SAFETY FIRST

New York, May 2—The Safety First Society of Greater New York, which has been in process of formation for some weeks, is now permanently organized, with Ogden L. Mills as president, and active work is now in progress. Jefferson De Mont Thompson, Ogden Mills Reid, Charles L. Bernheimer, General Howard Carroll are vice-presidents; John X. Woodruff, treasurer, and Frederick H. Elliott, general secretary. The organization is composed of a number of social, civic and commercial bodies, industrial and transportation companies, etc., with a view primarily to devising and perfecting ways and means to:

The Safety First Society's campaign is of especial interest to motorists and the motor car industry generally, for its work

will tend to make drivers of cars more careful and the fewer motoring accidents there are the better it will be for the industry.

One of the important features of the society's numerous activities is a vigorous and comprehensive campaign of education in the public schools, embracing lectures by a staff of experts, who will show with graphic illustrations the more prevalent causes of accident and how they may be successfully avoided. This course should prove most effective in reaching the greatest number in the shortest time at minimum cost.

Lessening the number and degree of accidents occurring in the public streets and elsewhere, and the economic waste they directly entail.

Minimizing, through more scientific planning of traffic routes and regulation of traffic movement, the great economic waste which under present conditions falls as a financial burden directly upon those using the public thoroughfares for the purpose of distribution.

Creating a medium for the exchange of ideas as well as for the co-operative effort of those most vitally concerned, financially and otherwise, in a solution of these problems.

FORD SEEKS ELECTRIC PLANT SITE

Detroit, Mich., May 6—The Ford Motor Co. is negotiating for a factory site for the building of a plant in which to manufacture the low-priced electric that is to be marketed perhaps within a year. Options have been secured upon the property owned by the Chevrolet company across Woodward avenue from the Ford plant and also on a tract on the same side of the street and north of the plant. It is probable that the latter location will be selected, but the deal is not to be closed for a week. James Couzens, vice-president and treasurer of the Ford company, stated today that negotiations have been under way for sometime.

Holds Owner Liable for Guests' Safety

Massachusetts Issues Warning to Motorists

BOSTON, MASS., May 1—In its first bulletin service of the season the Automobile Legal Association of Boston, through W. A. Thibodeau, its general counsel, sends out the following information that is of general interest to all motorists because of its far-reaching effects:

"If the owner of a motor car invites his friends to ride with him and they are injured, he is liable to them, provided the accident happened through any negligence of his own. If the owner of a car has guests as occupants, and a collision occurs with another vehicle, and the drivers of the motor car and the other vehicle were both to some extent negligent, the guests could sue either or both drivers of the respective vehicles concerned in the collision; in other words, if a motorist has a guest who is injured in a collision, the motorist can be made to pay for the injuries sustained by his guest if his own negligence contributed, in the slightest degree, to the accident, notwithstanding the fact that the driver of the other vehicle was more negligent than he."

both held liable for disobeying this rule. It was held by the magistrate that the owner of the vehicle riding therein was liable, in like manner as the chauffeur, for approaching within 8 feet of the street car.

BAY STATE GRANTS RECIPROCITY

New York, May 4—Motorists who reside in other states but who spend less than 1 month in Massachusetts will not be required to obtain summer registration certificates in that state, according to a new ruling in that state. Secretary of New York State Mitchell May states that only those who intend to remain in Massachusetts 1 month or more will be required to obtain the usual summer registration licenses.

CYCLECAR MEET FOR DETROIT

Detroit, Mich., May 5—This city has been chosen as the rendezvous for all the cyclecar forces on July 4 and 5, when the Cyclecar Exhibition Co., a New York city organization, will hold a cyclecar exhibition and race meet at the state fair grounds and on the dirt track there.

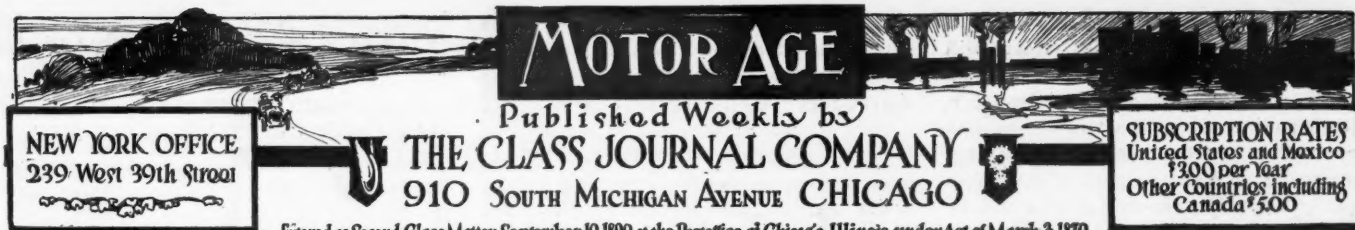
An extensive race program has been arranged for the 2-day meet, which is to be held under the contest rules of the Cyclecar Association of America, and the prizes and trophies for the races will aggregate about \$5,000, it is said.

It is planned to utilize three of the exhibition buildings for the showing of cyclecars, etc. The main building will be utilized for the exhibition of typical cyclecars, one of the adjacent buildings for the small cars, light cars and motorette show, and the third building in the group for the exhibition of commercial cyclecars and accessories. The three buildings allow an approximate 60,000 square feet of space.

PROTEST STREET CAR LAW

New York, May 4—With reference to the ordinance and police regulation that "a vehicle in overtaking or meeting a street passenger car which has been stopped for the purpose of receiving or discharging a passenger or passengers, shall not pass or approach within 8 feet of such car so long as such car is stopped," a meeting recently was held at the Lawyers' Club, where it was unanimously resolved that the attention of Police Commissioner Woods of this city be called to the fact that the ordinance applies to all vehicles and not only to motor cars.

Recently an owner and his driver were



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Fuel Economy a National Slogan

THAT there is a very acute and, at the same time, widespread interest in the operating expenses of motor cars again is evidenced in the general avidity with which the recent economy trials in Chicago and elsewhere have been followed. That manufacturers and their dealers are becoming cognizant of this general interest of the public can be taken to be a certainty from the increasingly frequency with which fuel mileage tests are being undertaken. The Franklin company, whose national May day economy contest produced such wonderful results, is to be congratulated more upon the progressiveness that called it into being, than upon the unexpectedly excellent showing made by its cars in the recent demonstration.

CHICAGO has been fortunate in being the scene of three economy trials since the first of the year, all of which have been instrumental in opening the eyes of the public to the progress that has been made in running gears, motors, and carbureters within the past few years from an efficiency standpoint. Also these have done much toward shedding light on the mooted question of the relative efficiency of four-cylinder and six-cylinder engines. In all three of the tests, six-cylinder-engined cars made remarkable mileages per gallon, mileages which compare favorably with those of four-cylinder engines of equal power. Each and every one of them has taught its lesson to the buying public, and therefore is of value to the industry.

THE Chicago Automobile Club has been fortunate in having the opportunity to supervise these economy trials, a work which is of at least as great importance to the everyday owner-driver as is the club's widely heralded successes in the promotion of speed contests. It is to be hoped that the effects of this organization toward the further enlightenment of the motoring public through economy trials will continue, although it is to be expected that the recent record of better than half a century on a single gallon of gasoline may dampen the ardor of many makers and dealers towards trials of this nature.

THAT the Chicago motoring organization still holds fuel economy a feature well worthy of endeavor may be surmised from the fact that it has incorporated within the rules of the national A. A. A. Chicago-Boston non-motor-stop contest, which is to be this year's Glidden, a clause providing for fuel economy awards to such entrants as desire it. Results of an economy trial conducted in connection with an event such as the day and night non-motor-stop run over such a variety of road conditions as obtain between the Windy city and the Hub probably would give nearly the actual consumption of fuel per mile that might be expected by the ordinary motorist in his everyday touring. It is to be hoped that manufacturers will take advantage of the opportunity thus presented to verify their claims for motor and car efficiency in a manner which nearly represents the conditions under which the buying public expects to drive.

The Cyclecar Situation

THE public, waiting to see and ride in cyclecars, and having as yet small opportunity, is wondering what has become of the much-heralded new motor movement. Seeing no cars which are in daily use, the man on the street is asking questions as to cyclecar progress. What has become of the cyclecar? Is there a slump in the movement? What takes the makers so long to get into the market?

THERE is no slump in the cyclecar movement, but rather the opposite. Makers who started out 6 months ago to turn out a cheapest-first-cost vehicle and who built on sound engineering ideas to produce the most comfort and safety in the lightest weight, found a vehicle in their hands which was more than a mere cheapest-car. It would do things which were new. It could go almost anywhere. It was comfortable beyond expectations. It had a basis of real beauty in its long, narrow lines, and it showed a marked sales value when the appearance and performance features were there. The chrysalis stage of development was this first perfecting of mechanical ideas aiming at performance. The cars worked well, but the makers were not satisfied that they had just what they wanted to put in the hands of the public.

THIS meant the building of advanced models and a perfecting of details and finish and art lines to make the vehicles in workmanship and dignity worthy of their performance possibilities, and with this the spending of more money in the building. The aim became not so much minimum first cost as

minimum cost of running, and the workmanship and extra care became a saving. Nickel-plated finish cost more to make, but saved more than its cost in sales, while the addition of greater accessibility, more flexible power plant and higher class material was added insurance to the buyer that in first cost he was getting his money's worth.

THE cyclecar today has come out of the caterpillar stage and is in the cocoon, a period of seemingly slow progress, but nevertheless progress, a period where growth is under cover, without the publicity and advertising of the butterfly stage, but just as important as a stage of growth. On the development of the hidden period depends the future color and form of the gaudy butterfly, the fuzzy experiment of the before-chrysalis stage being brought into real and active existence only through this seemingly dead stage of growth.

THE belief in the future of the cyclecar which is present with great enthusiasm in the minds of those really working out the problems of the new vehicles, and the quality of brain and quantity of capital that are being put into the study are a guarantee of the future of the cyclecar as a business and industry. Meanwhile several firms are shipping cars a carload a day. These are spread over many thousand square miles of territory and hence as yet make little showing, but the growth is there. This summer will be a period of trial and experiment and perfecting for the cyclecar as a vehicle in the hands of the purchasing public.

New Speed King for California, Young Alex Pabst

Los Angeles 15-Year-Old Wins Junior Vanderbilt and Grand Prix



START OF THE JUNIOR GRAND PRIX AT ASCOT PARK

CALIFORNIA has crowned a new speed king. He is not as portly as "You Know Me" Barney Oldfield, or as tall as Earl Cooper, but in Los Angeles he is just as famous as the cigar-chewing veteran and as much of an idol as the 1913 American champion. His name is Alex Pabst and he holds the title of "Viceroy of Velocity" for boy drivers 15 years of age and under.

Driving a miniature Stutz in the 2-day juvenile speed meet held on the 1-mile Ascot park track at Los Angeles recently, Alex won both the Vanderbilt cup and the grand prix. This is a feat never before accomplished even by older and more seasoned drivers, such as dePalma, Harry Grant and Ed Pullen. The two trophies that Alex annexed stand 16 inches high on an ebony base and have a diameter of 14 and 10 inches respectively. He stands ready to defend them.

The Stutz that Alex drove is an exact replica of the white car in which Earl Cooper rode to fame in 1913 and bears the same number—8—but it is only one-half the size of the champion's mount. It has a wheelbase of 60 inches and a tread of 36 inches and is fitted with 20 by 4-inch tires of the aeroplane type. The motor is a Flying Merkel twin-cylinder air-cooled engine and develops 6 horsepower. The drive is by V belt and the steering gear is made of spindle and flexible wire. The owner of the car, Walter M. Brown, general manager of the Walter M. Brown Co., Los Angeles agent for the Stutz and backer of Earl Cooper, says that the little No. 8 is "some car" and that little Alex Pabst is "some driver."

In winning the Vanderbilt cup, Alex covered 15 miles in 27 minutes and 47 seconds, against a strong wind. Alex made a Garrison finish in this event, coming from behind on the thirteenth lap and passing the pace-maker when the

stop. The following day, when the grand prix race was run, Alex went out after a record and got it. He covered 25 miles in 34 minutes flat—an average speed of 45 miles per hour—and on his fastest lap was clocked at 51 miles per hour. In addition to winning the grand prix, Alex established world's records for everything up to 25 miles in his class and defeated twelve of the speediest "foreign and American" cars.

Alex was not forced to stop once in his drive for the grand prix. According to the owner of the diminutive Stutz, there were no mechanical adjustments, the motor ran perfectly, no water was taken on during the race and the radiator was absolutely cool after the 25 miles were covered.

The juvenile speed meet attracted an enthusiastic throng. Six thousand persons saw Alex win the grand prix and howled their approval of the white-cowled driver.



FINISH OF JUNIOR VANDERBILT

latter's car lost an engine bolt and was forced to

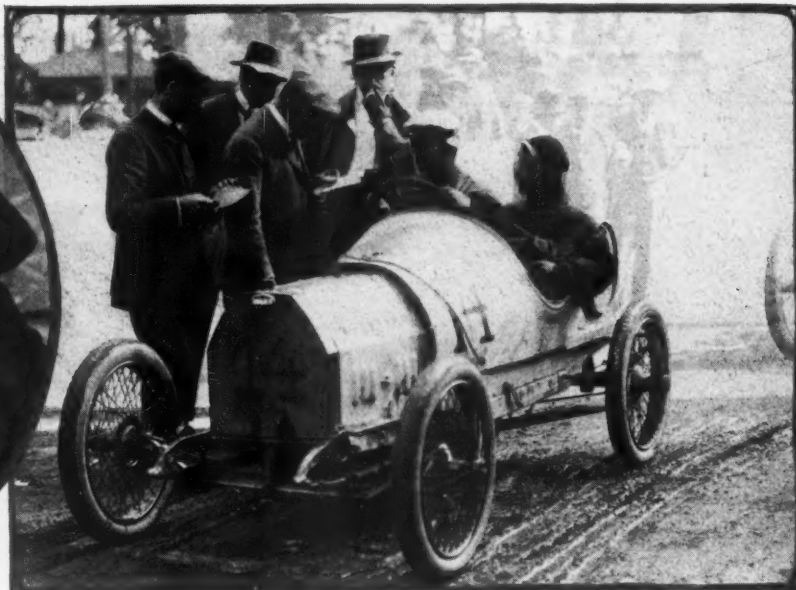
stop. Alex win the grand prix and howled their approval of the white-cowled driver.



THE STUTZ JUNIOR, BUILT HALF THE SIZE OF THE BIG CAR

Forty-five the Final Count for Indianapolis Race

Eleventh Hour Rush Almost Breaks Entry Record



ERNEST FRIEDRICH AND BUGATTI HE WILL DRIVE AT INDIANAPOLIS

INDIANAPOLIS, Ind., May 5—Allowing Uncle Sam plenty of time to get belated blanks into the hands of the management of the Indianapolis motor speedway, Manager C. W. Sedwick today took the final census and announced forty-five candidates for the fourth annual international sweepstakes, to be run May 30. This is within one of the record and gives added importance to the qualifying trials which are necessary in order to weed the field down to thirty as required by the rules.

In the first race, the one run in 1911 and won by Harroun in the Marmon, there were forty-six nominated, of which number forty started and twelve finished. In 1912, the year Dawson and the Marmon pulled down the big money, there were twenty-seven nominated; twenty-four started and ten finished. Last year, when Goux and the Peugeot were triumphant, there were twenty-nine entries and twenty-seven started.

Eleven Late Entries

The late mails brought in eleven entries for the 1914 race, including two Duesenbergs, a Braender Bulldog, Mason, Tatter, Rayfield, Titze, Ray, Washington, Isotta and an unknown and also brought into the competition at least three drivers of note—Hughes, Rickenbacher and Chandler. The others may be classed as dark horses. The Duesenbergs carried the Mason nameplate last year but this time Fred Duesenberg is flying his own colors. The Mason, however, is represented by one car, which will be driven by George Mason, son of the president of the Mason company and who had race experience at Milwaukee 2 years

By C. G. Sinsabaugh

ago. It is presumed that the Isotta will be handled by Marquis, although he has not been declared.

As for the rest of the late comers, they may be classed as the entries of enthusiasts who are eager to battle for the \$50,000 purse hung up by the management. The Tatter and Titze are Chicago entries about which little is known. The Tatter is entered by two brothers who are ambitious to prove to the industry that it is possible to rebuild old cars into speed creations. They have made a business out of rebuilding old cars and they believe they can prove their theory.

Hughes in Rayfield Six

Hughes has been working on the Rayfield six for some time. The concern was represented in the Elgin races 2 years ago but since that time has been out of the racing game. The Ray comes from Indianapolis and will be driven by Brock, who is known as a motor boat enthusiast. The unknown is an entry made at the last minute, the nominator withholding his identity until he can find a driver. It is said to be a special-built car.

While the entry list is a big one, yet it must be admitted that the American motor industry is not as well represented as it might be. It has been left to such concerns as Stutz, Mercer, Maxwell and Great Western to fight the invaders, but even at that the combination looks a strong one. In the majority of cases the American representation consists of private entries made by owners who see a chance to pull down big money and also to achieve a reputation.

For the first time the foreign representation is most formidable, with Peugeot, Delage, Sunbeam, Excelsior and Bugatti actually sending over cars and drivers, while Mercedes is represented through the support given by two American sportsmen, while the Italian Isotta is sent to the tape by the importing concern.

Twenty-nine different makes are included in the forty-five entries. Five of the cars are six-cylinder creations, two Sunbeams, the Belgian Excelsior, one of the two Mercedes and the Rayfield.

Case was the only prospect that failed to make its appearance this year. There was an entry by Roy C. Bauer, of Buffalo, which was rejected because the motor was over the speedway limit, and another by R. C. Pennebaker, of Memphis, who did not make up his mind in time. In another column will be found the complete entry list.

Plan for Elimination Trials

Multiplicity of entries has caused officials of the contest to suggest extending the period of elimination trials, at present limited to 2 days, starting Wednesday, May 27, to 3. With forty-five cars in the field, and at least 30 minutes required to try each one three times on separate days, it becomes apparent that extra room will have to be found somewhere. The present plan is to advance the date of starting to Tuesday instead of Wednesday, Friday, the day before the race, being reserved for putting the track in shape. American Automobile Association officials are at present considering the matter in detail, so that a decision will no doubt soon be reached.

Construction of a new stand on the south turn of the speedway has been ordered, due to the extremely heavy seat sale. This makes the eighth pavilion to go up in all, with practically a mile of frontage, and seating accommodations for 60,000. Plenty of space is still available elsewhere, of course, many seats not being sold until the final day. Meanwhile, a general overhauling of all structures on the grounds is under way, under the supervision of state inspectors, so that fear of accident need be felt by no one. Improvements to date for 1914 are two new stands, not counting the latest one, a big tunnel under the south end of the track to the infield, and a number of minor additions, such as garages.

Charles F. Keene and Charles F. Rogers, entrants of the Beaver Bullet, arrived at the track yesterday with their car for a preliminary workout. They propose to use airless tires during the contest. Keene and Rogers are both resident engineers of Beaver Falls, Pa., having formerly been connected with the Mercer factory.

Goux and Boillot secretly sailed on the Olympic from Cherbourg April 29, thereby stealing a clean march on their compatriots, notably Guyot and Thomas of Oelage, and Chassagne of the Sunbeam, who were under the impression that they were all to embark together May 9. They landed in New York Tuesday.

FINAL ENTRY LIST FOR INDIANAPOLIS 500-MILE RACE

No.	Car	Nation	No. Cyl.	Bore and Stroke	Piston Disp.	Driver	Nation
1	Burman	American	4	5.1 x 5.5	449.4	Burman	American
2	Stutz	American	4			Cooper	American
3	Stutz	American	4			Oldfield	American
4	Gray Fox	American	4	5 x 5.5	431.9	Wilcox	American
5	Beaver Bullet	American	4	5.1 x 5.5	449.4	Keene	American
6	Peugeot	French	4	3.9 x 7	341.7	Goux	French
7	Peugeot	French	4	3.9 x 7	341.7	Boillot	French
8	Maxwell	American	4	4.2 x 8	445	Tetzlaff	American
9	Sunbeam	English	6	3 x 5.9	245	Chassagne	French
10	Delage	French	4	4.1 x 7	380.2	Guyot	French
12	Excelsior	Belgian	6	3.8 x 6.2	446.6	Christiaens	Belgian
14	Peugeot	French	4	3 x 6.1	183	Duray	French
15	King	American	4	5.1 x 5.5	449.4	Klein	American
16	Delage	French	4	4.1 x 7	380.2	Thomas	French
17	Burman	American	4	5.1 x 5.5	449.4		
18	Mercedes	German	6	4.1 x 5.5	445	De Palma	American
19	Mercer	American	4	4.8 x 6.2	445	Wishart	American
21	Mercer	American	4	4.8 x 6.2	445	Bragg	American
22	Mercer	American	4	4.3 x 5	300	Pullen	American
23	Mercedes	German	4	4.4 x 7.2	448	Mulford	American
24	Stutz	American	4			Anderson	American
25	Maxwell	American	4	4.2 x 8	445	Carlson	American
26	Marmon	American	4	4.5 x 7	445	Dawson	American
27	Sunbeam	English	6	3.1 x 5.9	273	Grant	American
28	Stafford	American	4	4.2 x 5.1	290.7	Callahan	American
29	Metropol	American	4	4.2 x 7.1	446	Horan	American
31	Keeton	American	4	5.1 x 5.5	449.4		
32	Maxwell	American	4	4.2 x 8	445		
33	Texas	American	4	5.1 x 5.5	449.4	Clark	American
34	Bugatti	German	4	3.9 x 7.1	350	Friedrich	German
35	Great Western	American	4	4.2 x 8	445	Jenkins	American
36	Great Western	American	4	3.7 x 5.7	254	Price	American
37	Great Western	American	4	4.2 x 8	445		
38	Bull Dog	American	4	4.3 x 6	350	Chandler	American
39	Pope Bullet	American	4	4.7 x 5.7	407	Roberts	American
41	Washington	American	4	4.7 x 5.7	407.6	Stringer	American
42	Duesenberg	American	4	4.4 x 6	360.5	Rickenbacher	American
43	Duesenberg	American	4	4.4 x 6	360.5		
44	Mason	American	4	4.4 x 6	360.5	Mason	American
45	Tatter	American	4	4.1 x 5.3	286	Mazzucco	American
46	Rayfield	American	6	4.1 x 5.5	442.6	Hughes	American
47	Titze	American	4	5.1 x 5.5	449.4		
48	Ray	American	4	5.1 x 5.5	449.4	Brock	American
49	Isotta	Italian	4	4.7 x 6.3	443.8		
50	Unknown			Not given		Not given	

Bugatti New Car in American Racing

Record in Europe Shows it to Be Speedy

By W. F. Bradley

PARIS, April 24—Ettore Bugatti, of Molsheim, Alsace, has handed to the European representative of the Indianapolis motor speedway the engagement of one Bugatti car to be driven by Ernest Friedrich in the Memorial Day race. This will be the first public appearance of Bugatti in America. Throughout Europe Bugatti is recognized as one of the cleverest of the world's motor car engineers, and the model best known to the public is a small but expensive car of only 65 by 110 millimeter bore and stroke which recently went through the tour of France with a clean score. It is an open secret that Bugatti is responsible, as consulting engineer, for some of the best work on leading French cars.

The machine to be sent to Indianapolis is a four-cylinder monoblock of 100 by 180 millimeters bore and stroke, thus having a cylinder area of 345.08 cubic inches. It has same general design as the standard Bugatti cars, with twelve overhead valves operated by inclosed valve gear. By the use of the very finest materials throughout, the total weight of the car has been kept to unusually low limits.

Ernest Friedrich, the driver of the Indianapolis car, has figured for the last 5 or 6 years as the Bugatti champion. He

has not taken part in the leading speed contests, for Ettore Bugatti never has been willing to build special racing machines, but there hardly is a touring, hill-climbing or short-distance speed test in which he has not been a participant.

It is probable that Boillot and Goux will sail for America at the end of April, it being their intention to do some sight-seeing in the east before proceeding to Indianapolis. The main European party has booked accommodations on La Provence, sailing from Havre on May 9. This party comprises Albert Guyot, René Thomas and two Delage mechanics; Joseph Christiaens and Excelsior mechanic; Jean Chassagne and Sunbeam mechanic; Arthur Duray and E. Matthys, responsible for the 3-liter Peugeot; Ernest Friedrich and Bugatti mechanic, and W. F. Bradley.

BIG WESTERN TOUR STARTS

Denver, Colo., May 6—The Colorado-New Mexico-Texas-Oklahoma-Kansas sociability and good roads run of 2,500 miles, conducted by six southern Colorado commercial organizations, started today from Colorado Springs and Pueblo. The tour will be made by nearly forty Coloradans, in ten motor cars, and will take in more than a hundred towns in the five states. To join the snow-capped mountains of

Colorado and the balmy shores of the Gulf of Mexico with a bond of motoring fellowship and road betterment co-operation is announced as the chief aim of the trip.

Upon entering New Mexico, Texas, Oklahoma and Kansas the tourists will be met by the respective governors, W. C. McDonald, O. B. Colquitt, Lee Cruce and George H. Hodges, and will be escorted across these states by welcoming delegations of motorists. Unable to accompany the party as far as Raton Pass, at the New Mexico line, Governor E. M. Ammons, of Colorado, asked one of the leaders of the enterprise to represent him.

To promote the "See America First" movement by demonstrating the delightful touring possibilities of this section of the country is one thing the trip is counted upon to accomplish. Another is to increase interest in highway improvement throughout all five of these states. A great deal of road work this spring at points all along the route decided upon has been reported, a large part of which is believed to have been done principally in preparation for this sociability run.

The trip will occupy 3 weeks, and the time has been scheduled for the following division: First week, Colorado Springs through Trinidad and Raton to Fort Worth and Dallas over the Colorado-to-the-Gulf highway; second, triangular trip through Waco, Austin, San Antonio, Galveston, Houston and back to Dallas; third, through Oklahoma City to Wichita over the Texas and Gulf highway and back to Colorado over the Santa Fe trail.

Ninety-Four Franklins Average 32.8 Miles Per Gallon

Results of Company's National Fuel Test

RECORD OF PERFORMANCES IN FRANKLIN 1-GALLON GASOLINE TEST

City	Dealer	Weather	Record	City	Dealer	Weather	Record
Milwaukee, Wis.	William F. Sanger	Fair	51.2	San Diego, Cal.	Wilson S. Smith	Rain	33.1
Cumberland, Md.	A. E. Glisan	Fair	50.9	Binghamton, N. Y.	S. H. Lewis	Fair	32.8
Boston, Mass.	Otto A. Lawton	Fair	49.5	Duluth, Minn.	D. Peacha, Jr.	Windy	32.7
New Haven, Conn.	Cowles Tolman	Fair	48.5	St. Paul, Minn.	A. H. Clark	Fair	32.5
Seattle, Wash.	W. A. Wicks	Fair	43.0	Washington, D. C.	David S. Hendrick	Windy	32.4
Kansas City, Mo.	E. F. Williams	Cool	42.9	Peoria, Ill.	S. K. Hatfield	Fair	32.2
Minneapolis, Minn.	L. A. McKay	Windy	42.8	Laramie, Wyo.	E. Lovejoy	Fair	32.1
Spokane, Wash.	J. A. Nichols, Jr.	Windy	42.5	Kingston, N. Y.	William M. Davis	Windy	31.7
Elizabeth, N. J.	F. V. Price, Jr.	Windy	51.2	Scranton, Pa.	O. D. DeWitt	Fair	31.7
Syracuse, N. Y.	T. A. Young	Windy	40.3	Poughkeepsie, N. Y.	William M. Davis	Windy	31.6
Salt Lake City, Utah	J. E. Langford	Wet	40.1	Wilkesbarre, Pa.	William S. Dee	Windy	31.5
Canton, Ohio	Geo. W. Belden	Fair	39.9	Oakland, Cal.	Frank Bartels	Windy	31.5
Sioux City, Ia.	Thomas Murphy	Fair	39.6	Great Falls, Mont.	B. D. Whitten	Fair	31.4
New York City	G. A. Tisdale	Windy	39.4	Chicago, Ill.	F. H. Sanders	Fair	31.3
Akron, Ohio	A. Auble, Jr.	Windy	39.3	San Antonio, Texas	L. F. Birdsong	Rain	30.8
Portland, Ore.	J. C. Braly	Fair	39.1	Pittsburgh, Pa.	W. Murray Carr	Fair	30.5
Philadelphia, Pa.	James Sweeten, Jr.	Windy	38.3	Erie, Pa.	John Griffith	Windy	30.5
Winnipeg, Man.	James B. Stephens	Fair	38.0	Utica, N. Y.	W. W. Garabrant	Windy	30.4
St. Louis, Mo.	Joseph B. Dryer	Fair	37.9	Edmonton, Alta.	Holland W. Ross	Fair	30.3
York, Pa.	T. S. Pfeiffer	Windy	37.9	Norwich, N. Y.	A. M. Jones	Windy	30.0
Cincinnati, Ohio	Newman Samuel	Fair	37.3	Colorado Springs, Colo.	G. W. Blake	Rain	30.0
Springfield, Mass.	W. W. Anderson	Fair	36.8	Dallas, Texas	W. G. Langley	Windy	29.9
Auburn, N. Y.	George H. Leonard	Windy	36.6	Sheboygan, Wis.	N. P. Hanson	Windy	28.6
Hoosick, N. Y.	John Moseley	Fair	36.5	Phoenix, Ariz.	George Hageman	Rain	28.6
San Francisco, Cal.	John F. McLain	Windy	36.1	Sioux Falls, S. D.	Knapp Brown	Fair	28.1
Bar Harbor, Me.	Fred L. Savage	Fair	36.1	Reading, Pa.	James M. Kalbach	Fair	27.8
Baltimore, Md.	W. F. Kneip	Windy	36.0	Buffalo, N. Y.	George Ostendorf	Windy	27.7
Charlotte, N. C.	J. B. Woodside	Windy	36.0	Youngstown, Ohio	J. Stuhldreher	Windy	26.4
Geneva, N. Y.	W. W. McCarroll	Fair	35.7	San Angelo, Texas	M. C. Ragsdale	Rain	26.3
Hagerstown, Md.	H. E. Baker	Fair	35.3	Denver, Colo.	F. C. Cullen	Rain	26.3
Waterloo, Ia.	R. H. Cramer	Wet	35.1	Washington, Ia.	Sidney S. Smith	Fair	26.2
Louisville, Ky.	George M. Younger	Fair	35.1	Portland, Me.	W. M. Chellis	Fair	26.2
San Jose, Cal.	L. Normandin	Fair	34.9	Greensburg, Pa.	E. L. Turner	Fair	25.7
Rochester, N. Y.	G. R. MacCollum	Windy	34.8	Paterson, N. J.	J. S. Hughes	Fair	25.1
Los Angeles, Cal.	R. C. Hamlin	Rain	34.8	La Crosse, Wis.	Alfred James	Fair	25.0
Providence, R. I.	Wallace L. Wilcox	Windy	34.4	Hutchinson, Kans.	L. B. Young	Fair	25.0
Newark, N. J.	W. L. Mallon	Fair	34.4	Tulsa, Okla.	W. P. Chapple	Fair	24.8
Bridgeport, Conn.	Arthur L. Clark	Windy	34.4	Rising Sun, Ohio	E. F. Day	Windy	24.0
Worcester, Mass.	V. J. Eckberg	Windy	34.3	Shreveport, La.	W. H. Johnson	Fair	23.7
Little Rock, Ark.	J. F. Jones	Fair	34.1	Eau Claire, Wis.	G. R. Wood	Fair	23.7
Walla Walla, Wash.	R. H. Tuttle	Windy	34.0	Grand Rapids, Mich.	John Vlasblom	Fair	22.5
Newburgh, N. Y.	George Mason	Fair	33.9	Victoria, B. C.	G. H. Grant	Fair	22.0
Hartford, Conn.	H. P. Seymour	Windy	33.8	Bangor, Me.	Edwin O. Hall	Windy	21.5
Pendleton, Ore.	J. W. McCormach	Fair	33.8	Galesburg, Ill.	E. T. Bryam	Fair	20.2
Putnam, Conn.	O. C. Bosworth	Windy	33.3	Uniontown, Pa.	C. W. Johnson	Windy	18.9
Dayton, Ohio	F. B. Heathman	Fair	33.2	Aberdeen, S. D.	G. M. Worthington	Fair	18.3
Albany, N. Y.	C. G. Heck	Windy	33.1	Georgetown, Texas	T. J. Caswell	Rain	17.2

SYRACUSE, N. Y., May 2—Ninety-four Franklin six-cylinder cars yesterday covered distances totaling 3,086 miles, equal to the distance across the continent, at an average of 32.8 miles to the gallon of gasoline. The national May day Franklin economy trials proved that it is possible for a six-cylinder car to travel over 51 miles without using more than 1 gallon of fuel. The trials also showed that it was possible for such a car to run over 31 miles per gallon without resort to coasting. Regardless of weather conditions, Franklin dealers throughout the United States and Canada drove as far as they could on a measured gallon of gasoline. Each test was supervised by two prominent officials and the results sworn to before a notary. **Showing an Exceptional One**

The Sanger Automobile Co., Milwaukee, Wis., made the highest mileage, traveling 51.2 miles on 1 gallon of fuel. It is estimated that fully 55 per cent of the distance covered was coasting. This makes the Chicago record of interest as this was made without coasting. The average record of the ninety-four dealers was 32.8 miles on 1 gallon of gasoline. The individual records ranged all the way from 17.2 to 51.2 miles. Each test was made with the car in perfectly normal condition. The routes covered led over paved streets, country roads and up and down

hill, and in each case was a round trip, the finish being as close to the starting point as possible.

The test was thoroughly practical in every way. This is shown by the rules, which were that the test must be held Friday, May 1, no matter what conditions of road and weather; that only 1 gallon of gasoline was to be used—the gallon measure employed to be certified by the local sealer of weights and measures; that absolute accuracy must be followed out in every detail; and that the mileage be certified by both driver and observers before a notary public.

The success of the test did not depend on any one man but on the Franklin dealers as a body. Different drivers, roads, cars, qualities of gasoline, conditions of weather and degrees of skill in operating a car, all tend to produce a general average that is a real indication of practical worth.

There was no entry list. Each Franklin dealer wanted to make the test, which was the outcome of the dealers starting the ball rolling themselves. Franklin dealers have been holding tests at almost any time of the year in their own cities and finally a Pacific coast dealer and one on the Atlantic coast at the same time suggested a test on one day by all dealers.

The lowest record was that of the

Georgetown, Tex., dealer, who had to contend with a rainstorm and went 17.2 miles on his allotment. Boston conditions seemed good for Franklin economy, the dealer there winning third place with 49.5 miles. New York placed fourteenth with 39.4. The high wind there impaired the showing.

How Milwaukee Did It

Milwaukee, Wis., May 2—To the Sanger Automobile Co., Milwaukee, representative of the Franklin car, belongs the honor of winning the May-day economy test conducted by the Syracuse factory at all of its branches and principal agencies throughout the United States, with an official record of 51.2 miles per gallon of fuel. The result of the test was astonishing even to the sanguine agents, particularly when word was received that the general average mileage obtained from Franklin cars in this test was less than 35. In the preliminary to yesterday's test, held on April 17, the same Franklin little six-30 made only 38.8 miles on 1 gallon of gasoline, and the record-breaking mileage made yesterday therefore was especially surprising.

The Milwaukee Franklin test car started at 9:45 o'clock a. m. with the temperature 47 degrees Fahrenheit. It checked in, upon the exhaustion of the 1-gallon fuel supply, at 1:28 o'clock p. m., having covered 51.2

miles. Every inch of the route was within 1 mile of Lake Michigan, and with the exception of one or two blocks the car covered asphalt pavement all the way. It is figured by the observers that about 55 per cent of the distance was covered by coasting, although the route selected for the test was fairly even and contained only one or two inclines that might be called fair gradients. Weather conditions for the test were considered favorable, there being sunshine throughout and only a slight breeze blowing off the lake. The official weather bureau temperature record during the time of the test varied between 43 and 51 degrees Fahrenheit.

The test car is a demonstrating machine received by the Sanger company last fall and had been driven 4,300 miles. No work had been done on the car until immediately after the preliminary test on April 17, following which the motor was taken down for decarbonization and grinding of valves. The car carried three passengers: Casper Sanger, driver; Oscar F. Fischedick, representing the Milwaukee Automobile club, and George H. Moeller, representing the newspapers.

The Sangers inserted a cardboard shield over the air opening in the front of the Franklin hood to gain the benefit of heat, this being deemed advisable because of the temperature of the atmosphere during the test, which averaged 46.7 degrees Fahrenheit. Otherwise the car was regularly equipped and nothing was done to reduce weight or wind resistance.

The Chicago Performance

Chicago, May 2—Simultaneously with ninety-three other owners and dealers in Franklin cars throughout the country, F. H. Sanders, the Chicago agent of the Franklin, sent a six-cylinder air-cooler on the economy test yesterday, and set up very respectable figures of 31.3 miles on one gallon of gasoline. Though this mileage was less than the 32.8 miles, which was the average run of all the Franklins yesterday, the showing ranks with that of the Milwaukee agent of 51.2 miles from the point of view of the owner driver. This is because the carbureter was not adjusted for economy alone, but for power and speed and flexibility as well. Also, unlike the test as run in the other cities, the driver did not touch his foot to the clutch pedal during the entire run, so that coasting was not resorted to to increase the mileage.

Conditions of the run were made identical with those of the Chandler-Rayfield test the day before, the only exception being that the Franklin carried three people instead of four. The car weighed, with its passengers, 3,040 pounds and without passengers, 2,750 pounds. This, by the way, is only 25 pounds more than the advertised weight of the Franklin and can be more than accounted for by the extra robes and paraphernalia of the officials.

The route selected was the same as that of the day before, being through the park

and boulevard system, and after the economy run the car was driven to Hubbard's Hill where two climbs were staged, one with a standing start and the other a high-gear run, beginning the ascents at a speed of 7 miles per hour. In both cases the summit was reached at a 20-mile speed. On the flexibility test the car showed a range of $3\frac{1}{2}$ to 45 miles on high gear. No adjustments were made to the carbureter other than those which can be accomplished by the dash adjustment regularly provided on the Franklin.

The same officials supervised this trial as were in charge of the Chandler the day before, Chairman F. E. Edwards and Darwin S. Hatch, of the Chicago Automobile Club technical committee. L. M. Springer was the driver. Springer's driving was remarkable in its consistency, as his speed never was less than 14 or greater than 16 miles per hour during the economy trial.

BUICK INTERCITY ECONOMY

Cincinnati, O., May 1—A Buick six averaged 26.6 miles to the gallon of gasoline in an intercity run, April 27, from Cincinnati to Dayton, O., a distance of 53.2 miles.

Chandler Given 1-Gallon Fuel Test

Rayfield Carbureter Trial Produces 24.4-Miles Mark

CHICAGO, May 1—A Chandler six-cylinder car equipped with a Rayfield carbureter yesterday established a record of 24.4 miles per gallon of gasoline in a combined economy and efficiency test arranged by the Findeisen & Kropf Mfg. Co., and conducted by officials of the Chicago Automobile Club. In spite of the excellent showing as to consumption, the test was more than an economy one, as power and speed tests were made as well, which indicated that the mixture in the carbureter had not been weakened to a point at which those items were sacrificed in order to gain great economy. The Chandler six used in the test was the demonstrating car owned by Thomas Hay, the local distributor. It has $3\frac{3}{8}$ by 5-inch cylinders, Bosch magneto, and a Rayfield G-3 $1\frac{1}{4}$ -inch carbureter, tires are 34 by 4 inches and an extra tire and rim were carried. The car weighed 3,700 pounds with four passengers in it and 3,530 without passengers.

When the economy test started, the main gasoline line was disconnected and a special tank substituted, into this a measured gallon of gasoline was poured and the car driven at a speed of 20 miles per hour over Chicago's boulevard and park system. Not once during the run was the clutch released so that there was no coasting. In making this mileage the windshield was down with the exception of the first 2 miles.

Without any adjustments of the carbureter or any other changes, the machine

The start was made from the Cincinnati Automobile club at 10 o'clock and the trip ended at the Dayton Bicycle club rooms at 1:15. Local newspaper men acted as observers.

E. J. Carpenter, technical engineer of the Cincinnati Automobile club, and also government engineer, presided as official starter. In the presence of the observers, he measured the gasoline in the tank with a ruler. The ruler was marked and put in a sealed envelope addressed to George W. Schroyer, mayor of Dayton. Upon arrival at Dayton the seal on the gasoline tank was broken, the ruler was plunged into the tank again, and enough gasoline was poured in to meet the level of the mark made before the start. Only 2 gallons were required.

The total weight of the car was 4,700 pounds, and the weight of the driver and four passengers 870 pounds, leaving 3,830 pounds for the weight of the car with full equipment of extra tire, full radiator, and gasoline tank. The gasoline tested 66 degrees specific gravity; temperature 74 degrees. The speedometer that was used in the Buick trial was tested by the Stewart-Warner branch.

was driven to Hubbard's hill to display its hill-climbing ability. Starting at a rate of 8 miles per hour on high gear, the machine went up the hill finishing at 20 miles per hour. From a standing start, the car finished the climb at a pace of 20 miles per hour.

On a flexibility test, still with the same adjustments, the car was capable of speeds as high as 45 miles per hour and as low as 3 miles per hour. The tests were made under the supervision of F. E. Edwards, chairman, and Darwin S. Hatch, of the Chicago Automobile Club's technical committee. The car was piloted by W. C. Gruner, who won fame with the Ford in Algonquin hill climbs. Even a better showing probably would have been made had the weather conditions been more favorable. The thermometer registered 51 degrees Fahrenheit and a strong cold wind was blowing.

QUAKERS HOLD CYCLECAR SHOW

Philadelphia, Pa., May 2—Philadelphia's first annual light-car show opened tonight and will continue every afternoon and evening for 1 week. The exhibition is being held in the ballroom of the Hotel Majestic, Broad street and Girard avenue, and consists of cyclecars, light motor cars, accessories and motorcycles. Despite limited space the show is a representative one, comprising such well-known makes of cars as Car-Nation, Grant, Twombly, Trumbull, Metz, and others.

Late Happenings Among the Leading Manufacturers

American Efficiency Survey of Motor Car Units Organized

CHICAGO, May 5—Announcement of the plans of the newly organized American Efficiency Survey of Motor Car Units discloses an elaborate system of testing and recommending to parts buyers the units of car construction which the company finds best adapted for the service. The company was incorporated March 18 at Springfield with Harry Newman as president, Kenyon W. Mix as first vice-president and David Minard Shaw as second vice-president, secretary and treasurer. Newman formerly was the branch manager of the Moon Motor Car Co., at Chicago, and Mix and Shaw were connected with the Williams & Cunningham advertising agency.

The whole plan is to be put before the public in a campaign of national advertising within a short time, but the plans as they are now disclosed consist of the company's making exhaustive tests of every individual unit which enters into the building of a car, such as axles, radiators, oils, magnetos, carbureters, tires, and so on.

These tests are to be conducted at Purdue University by engineers of the Purdue staff, and, it is understood, under the supervision of Dean Benjamin, the head of the mechanical engineering department of the university. In addition to the engineering laboratory of the university and the Master Car Builders' testing laboratory the American Efficiency Survey has established a third testing laboratory and all three of these, it is understood, are to be employed. Upon the results of the tests of all the different makes of any one part, the company is to solicit membership of the manufacturer producing the best device, and upon the payment of a membership fee its product will be recommended in the advertising campaign.

In addition the company will maintain a bureau of technical information to give free service to inquirers upon any point connected with motor car engineering, the idea being, it is assumed, to recommend the products of the members. The first series of tests have been completed and it is stated that one of the largest concerns in the parts business has taken out a membership as based on the findings of the tests at Purdue.

AMERICAN'S ASSETS AUCTIONED

Indianapolis, Ind., May 4—The personal property formerly owned by the American Motors Co. was placed on sale at auction in this city, beginning April 30, the sale continuing several days. The property was bought some time ago by Samuel L. Winternitz & Co., Chicago auctioneers, who bought it for speculative purposes.

As was previously announced, the property was sold in small lots, the owners refusing to accept bids for the property as

a whole. Winternitz bought the property at auction through Frank E. Smith, receiver and trustee in bankruptcy for the American Motors Co.

It was thought that a company would be organized for the purpose of bidding in the property with a view to resuming the manufacture of the American underslung car. However, no such step was taken and it now appears that the American, for many years one of the best known cars in the United States, now will pass out of existence.

The good will of the bankrupt concern, patents if any, jigs and dies, list of customers and all correspondence were first placed on sale. These were bought by the Levene Motor Co., of Philadelphia, for \$4,000. This company expects to continue the sale of parts and service for the approximately 45,000 American cars which are now in use.

There were about 200 bidders at the sale and the bidding was naturally more or less spirited. Practically all of the Indianapolis motor car factories and many from throughout Indiana and other states were represented at the sale.

TRUCK LIABILITY RATES RAISED

New York, May 1—A readjustment of motor car liability rates has been made, effective on and after this date. This change, as applied to the greater New York territory, does not materially affect the rates for private pleasure cars except in that new rates have been created for public liability only at \$2.50 less than the old rates, which continue for public and employers' liability. New rates also have been created covering public, employers and compensation under the workmen's compensation laws of any state at \$7.50 over the old rates.

The principal change in the new schedule is in the rates for commercial cars, which have been advanced from 20 to 40 per cent over the old rates, with a corresponding increase in the cost for property damage coverage. The following table affords a comparison of the old and new rates for commercial cars under the various classifications:

	Liability		Property damage	
	Old	New	Old	New
Class 1.....	\$175	\$250	\$ 70	\$100
Class 2.....	150	200	60	80
Class 3.....	125	150	50	60
Class 4.....	90	125	36	50
Class 5.....	70	100	28	40

The new rates on these cars for liability are for public liability only, there being an additional charge of \$3.50 and \$5 for the employers' liability. The classifications above referred to in the table are as follows:

Class 1—Baggage transfer, electric light companies, express companies, mail wagons, newspaper delivery, police patrol, street railway companies, telephone and telegraph companies.

Class 2—Boiler dealers or makers, invalid carriages, iron and steel, junk dealers, machinery dealers, railway iron.

Class 3—Bottlers, brewers, department stores, dry goods stores, furniture moving, liquor dealers, news companies, oil distributing companies, parcel delivery, parcel post, safe movers and manufacturers, truckmen, warehouse and storage motor cars.

Class 4—Barrel and box manufacturers or dealers, building material merchants, carpenters, cleaners and dyers, coal dealers, contractors, feed and grain dealers, furniture dealers, gas and water mains, ice cream dealers, ice dealers, laundries, lumber dealers, masons' materials, mineral water dealers, piano movers and dealers.

Class 5—Vacuum cleaning motor cars, all commercial motor cars not otherwise classified.

MAXWELL'S PRODUCTION RECORD

Detroit, Mich., May 5—With the shipment of 175 cars on Thursday, April 30, the Maxwell Motor Co., of Detroit, broke its production records for both daily and monthly output. A total of 3,200 cars were shipped from Maxwell plants in the last 30 days and as there were only 26 working days in April, an average manufacturing schedule of over 123 cars per day was maintained.

A production of 60,000 cars is planned for 1915, but there is a possibility of this being increased later on. Plans are being made for installing additional machinery which will be necessary in all the factories to obtain this increased output. Several new buildings probably will be erected in Detroit, as the Maxwell company owns extensive property adjoining its plants in that city.

MASSACHUSETTS GARAGE LAW

Boston, Mass., May 2—Chief J. H. Whitney, of the state police, has just issued the new laws and regulations relative to garages. As a result there will be a lot of changes necessary within the next few months on the part of garage and repair shop owners throughout Massachusetts. Part of the regulations go into effect May 15 and others do not take effect until October 1 next.

As there is a penalty of not more than \$100 or 1 month's imprisonment, or both, for violation of the laws and regulations, and as the permit for a garage may be revoked for cause, the law has real teeth in it. In the new law relative to garages, if one seeks to get a permit now he must advertise the fact and send special delivery notices to owners of abutting property. Then there must be a public hearing before some municipal body and the applicant pays all the costs.

Some of the sections in the regulations have been in force for years relative to the keeping of garages, but others are new this year. No garage may be maintained that is within 50 feet of the nearest wall of a hotel more than two stories, a hospital, school, theater or other public place of amusement. Where such garages have been maintained in the past the

regulations do not apply, unless the conditions, in the opinion of Chief Whitney, are hazardous.

MAY COMPARES CAR REGISTRATIONS

New York, May 4—Secretary of State May has sent out a report indicating the increase of motor car registrations shown by 1914 over 1913 and 1912. This is the period between February 1 and April 30, inclusive. The report shows that the market for the cars of high horsepower is not as good as it was and that the tendency is toward a car of somewhere around 35 horsepower. The figures are:

Year	Under 25 h.p.	25-35 h.p.	35-50 h.p.	Over 50 h.p.
1912	31,640	28,888	13,375	1,261
1913	36,316	33,296	13,702	1,151
1914	45,575	36,974	15,226	1,056

Last year shows a 13 per cent gain over 1912, and 1914 an 18 per cent increase over 1913. The increase is greatest in the under 25 horsepower class, where the 1914 percentage is 25 per cent higher than the total of 1913. The class between 25 and 35 horsepower shows an 11 per cent gain, as does the 35-50 horsepower division. There is a loss of 9 per cent in the last division.

RADFORD BUILDING A CAR

Detroit Mich., May 4—New York capital to the extent of \$250,000, all subscribed, is said to be back of a new light-car proposition which has been designed here by W. H. Radford, former chief engineer of the Warren Motor Car Co. No name has yet been given to the new concern, which proposes to establish a factory here and to turn out about 3000 cars for the first year.

The car is equipped with a 27½ by 4 block four-cylinder engine designed by the Corsair Motor Co. It is water-cooled by thermo-siphon and has Connecticut ignition. The wheelbase is 100 inches and the tread standard. With electric lighting the car is intended to sell for \$600 with a four-passenger body. Other specifications include shaft drive, Walker-Weiss semi-floating rear unit, with which is incorporated a set of gearless differentials to take the place of the conventional spur gear differential. A three-speed gearbox is located at the rear axle. A one-man top is a part of the equipment.

Although the definite organization of the company has not been completed, Mr. Radford has headquarters at 500 Moffat building, this city.

KELLY-SPRINGFIELD REFINANCES

New York, May 4—The refinancing plan of the Kelly-Springfield Tire Co. was adopted today with a total of 44,000 shares of stock out of 51,000 in its favor. The opposition, headed by A. M. Polack, a curb broker, received but 2 per cent or about 1,000 shares. This plan calls for an increase of the capital stock from \$5,149,500 to \$10,299,000, divided into 6 per cent cumulative preferred stock, \$4,239,200 7 per cent cumulative second preferred

stock, \$1,029,900 and common stock amounting to \$5,029,900.

The former capital of \$5,149,500 consisted of \$2,850,500 4 per cent income debenture bonds due April 1, 1915; \$1,149,500 6 per cent cumulative preferred stock, upon which dividend arrearages amount to 78½, and \$4,000,000 common stock. The 78½ per cent of back dividends on the stock are to be funded into new 7 per cent second preferred shares.

The old directors were re-elected, consisting of Van A. Cartmell, president of the company; F. A. Seaman, Austin Poole, Stephen Peabody, Gustave Maas, A. J. Scheuer and J. Oppenheim.

STEWART-WARNER ANSWERS BOYCE

New York, May 4—The Stewart-Warner Speedometer Corp. of New York has filed its answer in the suit brought against it 2 weeks ago by Harrison H. Boyce and the Motometer Co., Inc., and makes a sweeping denial of all the charges made against it. The defendant acknowledges its connection with the Stewart-Warner Speedometer Corp., incorporated under the laws of Virginia, but prays that the complainants be made to prove statements regarding the organization of the Motometer Co., Inc.

The Stewart-Warner corporation denies that it has infringed or conspired to infringe any rights of the complainants. It also claims that the exclusive right to the alleged improvements on which the Boyce patent No. 1,090,776 was granted are of no advantage or profit to the plaintiffs or either of them and denies any quality of invention in the same. Further answering, the defendant claims that patent No. 1,090,776 has always been void because all points covered in its claims were known and practiced long prior to the alleged invention. The defendant states that the device which it intends to put on the market is not similar in appearance to the complainants' device so as to be substi-

tuted by unscrupulous dealers. It also declares that neither by itself nor in conjunction with the Virginia corporation did it circulate advertising matter containing untrue statements regarding the plaintiffs' apparatus or business or false representations regarding the same.

HOUK WINS FIRST SKIRMISH

Buffalo, N. Y., May 5—Special telegram—The Houk Mfg. Co. won its first skirmish in the wire wheel patent suit brought by the Standard Roller Bearing Co. when Judge Hazel denied the Standard company's request for preliminary injunction in the United States district court here yesterday. The Standard claimed the Houk Mfg. Co. has no license from Rudge Whitworth to make wire wheels. The defendant claimed that it manufactures only and that the George W. Houk Co., for which it manufactures, holds the license. The judge held that the Houk selling company has a proper license under the Rudge-Whitworth triple spoke patent and declined to enjoin the Houk Mfg. Co.

CHANGES IN MCGRAW COMPANY

East Palestine, O., April 30—R. F. Taggart has retired from the board of directors of the McGraw Tire and Rubber Co., and has been succeeded by F. B. Squire of Cleveland. At a meeting of the board of directors on May 1 action was taken to provide for the increase of the capital stock of the company from \$1,000,000 to \$1,500,000.

CHALMERS' APRIL SHIPMENTS

Detroit, Mich., May 4—The month of April marked a new record for the Chalmers Motor Co. There were 1,568 cars shipped in that month, which was the largest in the history of the company. On the final day 101 cars were shipped. The value of the month's turnout was \$3,000,000.

Four Entries for Chicago-Boston Run Jeffery, Hupmobile and Car-Nation Named

CHICAGO, May 6—Entry blanks for the national tour, set for June 29-July 2, were issued this week and before they had been out a day the Chicago Automobile Club, promoting the affair, which is to be a day and night non-motor stop run from Chicago to Boston, had booked four entries. The first declaration came from Thomas J. Hay, local agent for the Hupmobile, who has elected to defend the Anderson trophy, won last year by the Hupmobile on the run to Glacier Park. Hay is making it a co-operative entry, expecting other Hupmobile dealers along the route to help him out. He will drive the car to the end of his territory, turning it over to the Cleveland agent, who will pass it on to the third man and so on to Boston.

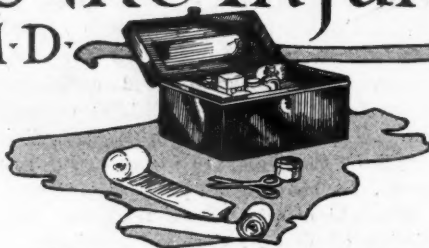
Two other entries for this division of the stock car class are coming from the makers of the Car-Nation, which will mark the debut of this concern into competition. It is said that Bob Burman is expected to drive one of the little cars.

A. M. Robbins, Chicago agent for the Jeffery, has entered his own personal car in the owners' division. This is permissible under the rules, which allow dealers or manufacturers to enter provided they own their cars and take their turns at the wheel in the contest.

Entries close June 1, so no time is being lost in canvassing the trade for support. Several of the big manufacturers are giving the tour serious consideration and their entries are anticipated.

First Aid to the Injured Motorist

By C.D. Enfield M.D.



Editor's Note.—Now that the touring season is about to open, the advice given herewith by Dr. Enfield should be remembered by those who make long trips. The author not only is an eminent physician in Iowa, but he also is a practical motorist, who has fully tested out the remedies which he offers to his fellow-drivers.

VOLUMES have been written about emergency repairs to the disabled motor car, and read with interest by cross-country and cross-county tourists. Novel repairs have been tried and endorsed, or condemned, until the driver who reads his best motor journal religiously can, on the spur of the moment, dope out a way to "get in" with almost any kind of a wreck. Very little, however, has been said about the minor repairs and adjustments which the tourist may occasionally be called upon to make upon his own person.

The growth of long distance motor touring and the popularity of trips which lead far from the centers of civilization make it imperative that the well-equipped tourist should have in his kit some simple "first-aid" outfit and should know how to use it. It is probable that it never will have a life, but it may sometime save a week or so on the sick list, and it is quite certain to cut short some little periods of discomfort.

Sample Kit Described

European motorists have awakened to these facts rather more rapidly than ourselves, if one may judge by the number of compact and yet complete first-aid outfits offered to the motor public by English and continental firms. It is, however, quite possible that the excellent finish and compactness of these little kits, together with the fact that they are well advertised, has been as effective in promoting their use as a general realization of the necessity for them. As a good example of their kind may be taken an outfit put up in an enameled metal box measuring $4\frac{1}{4}$ by $7\frac{1}{4}$ by $2\frac{1}{2}$ inches. It contains a half-dozen of the commoner medicines in tablet form, an ounce of sterilized cotton, borie lint, three bandages, collodion, a dressing for burns, safety pins, common pins, smelling salts, cold cream, a sponge, material for an eye wash, adhesive tape; and castor oil for use in the eye. It will be seen that this is little short of a miracle in compactness, and no motorist need begrudge the space required for an outfit of this sort.

Naturally, however, even more requisite than things to do with is the knowledge of how to do them. The first principle of modern surgery is cleanliness, and if the tourist-surgeon learns this thoroughly he will be far on the road to protection from needless damage as a result of neglect or improper treatment of little injuries. As is a matter of common knowledge, small injuries usually can do serious harm in only one way—by becoming infected. The skin, the clothing, and almost all other things exposed to air and dirt, are more or less covered with germs capable of infecting a wound. So in the nature of things every

accidental wound is more or less infected from the start. True, the tiny cells of the blood and of the tissues are capable of a certain amount of resistance to these invading microbes; this explains the fact that most small wounds give little or no trouble whether they are attended to or not.

But it is the part of wisdom to make the work of these phagocytic, or germ-destroying cells as easy as possible by destroying and removing as many of the germs as possible before they have time to do any damage. Thus, in a small cut or abrasion the first thing to do is to render the wound and the surfaces around it as nearly surgically clean, that is, bacteria-free, as may be. As any agent that will effectively kill germs will also kill the tissue cells, we try first to remove all the germ containing matter we can, and rely on antiseptics only for the last, and least, part of the cleansing operation.

Fortunately for the motorist, he has at hand two of the requisites for the dressing of a minor accidental wound, namely sterile or germ free water, and a good but not too violent antiseptic, gasoline.

The water in the radiator always is sterile or nearly so after anything of a run, because a continued temperature of 180 or over for a considerable time suffices to do away with the commoner bacteria. If to these ever-present surgical reagents be added a piece of sterile gauze or lint, a pair of small scissors and a little common adhesive tape, the procedure will be about as effective as if done in the physician's office.

The scissors should be dipped in gasoline to render them approximately sterile, and after opening the package of gauze in such a way that none of it comes even momentarily in contact with the fingers, the clothing, or anything else that might contaminate it, a bit of it is cut off and saturated in the hot water from the radiator. This should be done by having an assistant open the drain cock and then holding the gauze pledget in the stream that issues from it. The wound, and the skin about it, now is washed off thoroughly, using successively several pieces of wet gauze prepared with the same precautions. The surface now is dried with another piece of gauze, and sponged over with gasoline on still another piece. After this has dried, a piece of gauze is fastened over the injured area with a strap or two of the adhesive tape and the dressing is complete. This procedure takes but little time, requires few and simple materials, and makes a safe and efficient dressing.

When Injury Is Severe

In a more severe injury the first thing to be taken care of may be hemorrhage. If it is evident by the spurting of blood from the wound that an artery has been severed, a bit of rubber tubing or a handkerchief should be bound and tightened about the limb above the cut, and all haste made to a surgeon. If the location of the wound in such that this constriction above cannot be used to stop blood flow, pressure of a large hard dressing of the wound will have to be relied upon temporarily. In this case the injury should be hurriedly cleaned up as outlined above and a large wad of gauze bound tightly over it with a bandage. In small wounds where oozing of blood is so prolonged as to be troublesome, firm pressure for a few minutes usually will solve the problem. It need hardly be mentioned that such idiotic practices as applying chewing tobacco or a handful of earth to a wound never should under any circum-



"The dropper is filled with solution and the eye gently flooded with it"

stances be indulged in by the motorist.

Probably the average motor tourist is troubled more by dust and small foreign bodies, including the decidedly foreign bodies of insects, finding lodgement in his eyes, than by any other minor mischance of the road. And it is here that the budding surgical enthusiasm of the amateur Aesculapius who motors should be firmly restrained.

A good rule is that anything which will not wash out of the eye, or which cannot be removed without touching the cornea, or clear portion of the eyeball, had better be left for the surgeon's better trained skill. An excellent eye lotion, which should be in the supply locker of every touring car which is earning its name, is a 3 per cent solution of boracic acid, made up with sterilized water. With it there should be a medicine dropper, and the two should be kept clean in a little box of their own.

Bug in the Eye

When a bug finds lodgement in the driver's eye, a little of the boracic solution should be poured on a clean bit of gauze and used to sponge off the eyelids. Then the dropper is filled with solution and the eye gently flooded with it. This best can be done with the victim sitting in the front seat, tipping the head over the back of the seat, while the operator kneels or squats in the tonneau. The operator separates the lids with the thumb and one finger of the left hand while manipulating the dropper with the right. If two or three droppers full of solution do not wash away the foreign body, a very little sterilized cotton may be wrapped on the end of a toothpick or match and used as a swab. If gentle swabbing does not do the trick, or if the object is seen to be fast to the transparent portion of the eyeball, the relief driver had better take his place and start looking for a doctor without wasting any time.

Sunburn, prickly heat, and the other minor skin disorders which come as the result of continued touring in hot weather are by no means to be classed as accidents, yet they are capable of causing a good deal of discomfort. Oddly enough, we usually fail to foresee them and take adequate precautions; the pleasant memories of the last trip so far outweigh the recollection of the little unpleasantnesses that we are very apt to forget what we have coming until the end of the first hot day, when the arms and neck begin to remind us rather forcibly that they are covered with a delicate integument which cannot be abused with impunity. In the interest of comfort, then, a suitable soothing skin lotion or cream should be included in the list of medical supplies in the kit.

Lotion for Sunburn

A useful lotion for this purpose is composed of zinc oxide and bismuth subnitrate, each 2 drachms, carbolic acid 20 grains, glycerine half an ounce, and lime

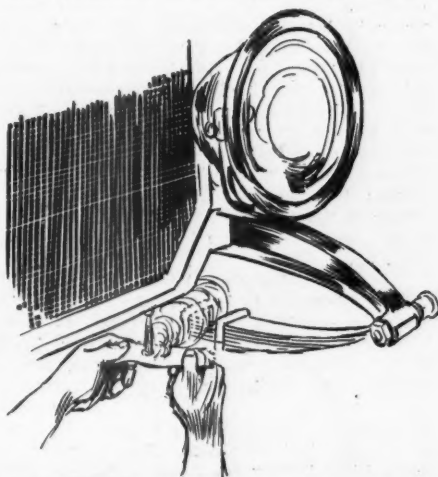


"In a more severe injury a bit of rubber tubing or a handkerchief should be bound about the limb above the cut"

water sufficient to make 8 ounces. This will need vigorous shaking before applying it, and may be used liberally. It can readily and inexpensively be made up by any druggist. If preferred a cold cream or mild boric acid ointment can be used of course, but the lotion probably is more effective in removing the sting of sunburn.

Dressing Small Burns

For dressing small burns, probably the best available material is carron oil, a mixture of lime water and linseed or olive oil, which is put up in collapsible tubes, sterilized, by several makers of surgical dressings. The burned surface should be cleaned up just as a cut would be, and then the carron oil applied on a layer of gauze and the whole covered over with rubber tissue or other impervious material before fixing in place with adhesive straps or a bandage. A mild 2 or 3 percent, carbolic ointment also is an available dressing material for small burns, but care should be taken that it is put up and kept in a sterile manner. In cases where a bit of burning waste, or a drop of burning gasolene, or indeed any corrosive substance gets into the eye the best roadside procedure is to instil a drop of ster-



"A bit of gauze is cut off and saturated with hot water from the radiator"

ilized castor oil, after washing with boracic acid solution.

In those fortunately rare cases where a smash-up results in a broken limb or other serious injury to some member of the party, there will of course be no question about looking up the nearest physician at once. If the injury appears to be very serious it is best to get the doctor to come to the patient. Otherwise he should be made as comfortable as possible; any severe bleeding checked as much as may be, and taken to the doctor's office with all expedition. It should be remembered that the doctor will be able to do his work better in his office, or in a hospital than he could by the roadside, but if the injury is serious enough, there may be some unnecessary hazard in moving the patient without the skilled oversight which the physician alone could give.

Tourists' First-Aid Kit

Bearing in mind the things which are apt to come up in any trip, and with an eye to compactness and the elimination of all articles not really needed, the tourist's first aid kit might well consist of the articles enumerated below:

- Small pair of straight scissors.
- Plain sterilized gauze in 1-yard rolls, two or three rolls.
- Plain sterilized absorbent cotton, 1 ounce.
- Two 1-inch muslin bandages, and one each of the 2, 2½, and 3-inch sizes.
- Two or three safety pins, and some common pins.
- Small piece of rubber tissue.
- Tube of sterilized carron oil or carbolic acid ointment.
- Roll of ½-inch adhesive plaster.
- Two-ounce bottle of sterile 3 per cent boracic acid solution.
- Medicine dropper.
- One-drachm bottle of sterilized castor oil.
- Bottle of skin lotion.

Where to Get the Kit

All these articles, with the exception of the skin lotion, may be obtained in a neat box, already packed to go in the tool box or under the seat. Or they may be bought separately from any good druggist and packed to suit the user. At any rate they should be kept clean and accessible. And if occasion for the outfit only comes after it has been carried for 2 or 3 years, it will pay its fare with more than compound interest.

Routes and Touring Information

Road Conditions on Lincoln Highway West of Chicago

MOTOR AGE herewith presents for the consideration of its readers up-to-date information regarding the condition of the Lincoln highway west of Chicago. In every case this information has been secured first-hand from residents of the territory through which the national trail runs and therefore should be most valuable. Those who contemplate a trip across the country usually want to know what they are going to encounter in the way of road conditions, which was the reason Motor Age inaugurated this service for the use of its readers.

While this information takes in only the territory west of Chicago, it is not intended to overlook the highways in the eastern section. This will be handled in a later issue. Eastern conditions are more settled than in the west, where improvements are going on all the time, hence the west is taken up first. In the accompanying review it will be found that the point nearest Chicago is Joliet, Ill., while the information generally takes in nearly every important link in the Lincoln highway.

Valparaiso, Ind.

It is possible to get out of Valparaiso in most any direction on good stone roads. Going from here to LaPorte there is a splendid road to Westville and from Westville a good stone road to either LaPorte or Michigan City. There is a good stone road running direct from Valparaiso north to Chesterton, 10 miles, then from Chesterton west clear into Gary or on a more southerly route to Hobart and from either place Chicago may be reached by stone road. Going in a southerly direction there is a stone road to Hebron, 16 miles. In a southeasterly direction with the exception of 2½ miles there is a stone road to Dunn's bridge by way of Kouts and from Dunn's bridge stone road all the way to Bass lake on the Indianapolis road. Going directly west from Valparaiso over what is known as the old Joliet road there is a stone road through Deep River on west to Merrillville at which point the road branches, one running to Crown Point and one directly west to Dyer.—J. R. Pagin.

Joliet, Ill.

To Valparaiso there is 8 miles of dirt and clay road which is bad in wet weather, the balance being good gravel and macadam. There is about 25 miles of good gravel and macadam in patches on the way to Kankakee and Champaign, the balance being natural dirt road, bad in wet weather, and good sand dirt. Twenty miles of the Bloomington road is good gravel, the balance a dragged dirt road which is fine in dry weather but bad after rains. To Ottawa and Moline about 20 miles of dirt-clay road is bad in wet weather, the balance being good gravel. The best route after rainy spells from Joliet is to Plainfield, Oswego to Ottawa being gravel all the way but some 20 miles longer. Joliet to Elgin is good gravel, and to Chicago, gravel all the way, 15 miles being very rough, but there is a good dirt track at the side in dry weather.—John H. Barnes.

Cedar Rapids, Ia.

West to Marshalltown and east to Waterloo the old transcontinental highway, now recognized as the Lincoln highway, is in very fine condition and will be improving steadily. The road to Waterloo is on the new Red Ball road, which runs from Minneapolis to St. Louis and which was just newly marked last fall, and all roads north and south have been extensively worked on. The road southwest to Ottumwa is a possible stretch of 25 miles to the heart of the Dutch settlement known as Anamosa, and is always in a very good condition. There a motorist would pick up the River-to-River road which always is kept in good condition.—Cedar Rapids Auto and Supply Co.

Boone, Ia.

The roads in this neighborhood are well drained, graded, with cement culverts, and partially graveled. They are easy to travel on except in the early spring.—Arthur Cray Motor Car Co.

Council Bluffs, Ia.

The road to Denison, a portion of the Lincoln highway, is in good condition now and will be kept in good condition. The going to Columbus, Neb., practically always is in good condition for travel. Of the two routes to Sioux City, the one skirting the foothills makes a better road for wet weather, and the other right up the river bottom is usually kept in good shape. The highway from Omaha to Kansas City via St. Joseph, marked O. K., also via Shenandoah and Marysville is kept dragged and in good shape. The River-to-River road and the White Pole road to Des Moines are also good, as is also the Blue Grass route to Red Oak, Creston, Ottumwa and Burlington.—Council Bluffs Auto Co.

Grand Island, Neb.

Grand Island to North Platte, also to Columbus, are good roads and kept pretty well dragged by the farmers.—Mat. Jarvis Auto Co.

North Platte, Neb.

North Platte to Big Springs is all good traveling, so it is continuing to Julesburg and Sidney.—J. S. Davis Auto Co.

North Platte, Neb.

Unless rains are exceptionally heavy the road from North Platte to Grand Island is in good condition. After such a rain the worst places would be between Lexington and Gathenburgh, but these roads are being worked with all possible haste and before the heavy travel begins this portion will be in good condition. Our roads are a dirt and sand mixture and dry very quickly after rains. Bonds for a \$52,000 concrete bridge at North Platte over the Platte river to be voted for this month will shorten the Lincoln highway 19 miles from Omaha to North Platte and will put the tourist on the line of the Union Pacific.—Hendy Ogier Auto. Co.

Rawlins, Wyo.

From Cheyenne to Laramie the roads are in first-class condition. From Laramie to Medicine Bow they are good, excepting a little muddy and slippery after small showers. From Medicine Bow to Rawlins they are generally good. Rawlins to Rock Springs is very good excepting a little muddy in a couple of flats, but not in bad condition. Rock Springs to Green River is very good, and Ogden and Salt Lake City is generally in good shape. So far we have had quite a number of tourists and

they report the roads as being generally satisfactory, and as this is the early part of the season when we get a little rain here, we expect that in the next few weeks the roads will be in first-class condition. At Cheyenne, Laramie, Rawlins, Rock Springs and Evanston give good service in the way of repairs, parts and supplies.—J. H. Jacobucci.

The road from Cheyenne to Rawlins has had considerable improvements made and some very expensive bridges at Bosler across the Laramie river and across the Rock river have been put in. The snow is now melting between Laramie and Cheyenne over Sherman hill and although cars have been over this route already this spring, in a month a car should be able to make the stretch in a day with ease. West from here the road is good crossing the continental divide, 28 miles west at an altitude of 7,200 feet, easy grades, almost all high-gear work to Green River, a few chuckholes around Rock Springs but we are after these in earnest and hope to have them eliminated shortly.—H. A. France.

Salt Lake City, Utah.

Being personally familiar with the conditions between Rawlins and Salt Lake City I think undoubtedly this is the best road without a question for tourists to travel from the east to this city and from this city to the east. A great deal of work has been done by the state, especially on that part of the road between Rock Springs and Wamsutter, which was notoriously a bad piece of road for the past several years. This has been greatly improved and there is no fear that the average tourist should entertain in making their route from Rawlins to this city. From Grand Junction to Salt Lake City is via the Midland trail. There was a great deal of money spent on this road during 1913, but it was badly washed out, especially through Price canyon, in the fall, and I understand that it is nearly impassable at this time. It is not a practical way for a tourist until a great deal of work has been done. From Salt Lake City to Ely via the southern route is good in dry weather, the only objection being the long distances that have to be covered, free from all signs of habitation, telephone or telegraph. The northern route around the lake has the advantage in this particular and there are more signs of civilization, better stopping places and telegraph communication can be had at nearly all points. A great deal of work is being done on the road from Brigham City to the Nevada line this spring, and I understand it is in splendid condition. When I say splendid condition, it does not mean a macadam oiled road, but we mean by that in this part of the country that a road can be traveled at a fairly good speed without any dangers of being hung up, excepting from mud that might be caused by heavy rains.—Tom Botterill Automobile Co.

Ely, Nev.

The condition of the highway from Ely to Salt Lake City is good except when raining and then it is a little bad at Fish Springs, but this road dries up 8 to 10 hours after a rain. Ely to Goldfield is about the best road in the state. Ely to Reno is good.—W. H. Bishop.

Sacramento, Cal.

At present the road from Sacramento to Reno is impassable owing to the fact that motor cars cannot get over the summit of the Sierra mountains until after the middle of

June. To San Francisco the road is in splendid shape and one can make the trip in about 5½ hours. Going north to Redding, as far as Marysville, there is macadam, with the exception of 15 miles of good dirt, then to Chico via Gridley and Live Oak it is in fair shape and getting better every day, and to Red Bluff and Redding it is good.—Don Lee Cadillac Motor Co.

San Francisco, Cal.

From Sacramento south weather conditions are now normal, but this whole territory, particularly southern California, has suffered severely from the torrential rains of the past winter. Many bridges are still washed out and some of the grades are at present dangerous, but it is possible for the tourist to reach any destination and travel safely by making detours, information regarding which can be obtained locally.

In northern California and in Oregon road conditions are not yet normal owing to the rainy season, and while tourists can get through, touring cannot be considered a means of pleasure until a matter of 4 or 6 weeks hence. On the summit between Sacramento and Reno there is still some 8 or 10 feet of snow and this much-traveled road to Reno and Lake Tahoe will not be available to motor cars before the latter part of June or July. All the counties are actively engaged in road work, and by the middle of May or first of June most well-traveled routes will be in excellent shape.—A. B. Barkman.

IMPROVING YELLOWSTONE TRAIL

The officers of the Yellowstone trail have designated May 22 as trail day, when it is expected 100,000 men will spend the day working the trail along its 1,100 miles of length from the Falls of St. Anthony to the Yellowstone National park. The governors of Minnesota, North and South Dakota and Montana have been

asked to get out on the trail and to be at a grand celebration at night in Hettinger, N. D., a half-way point. The governor of North Dakota will speak in the morning at Marmarth, where the bridge is to be built to connect the two sections of the highway.

Work on the trail on trail day is to be done with teams, shovels, picks, road drags, discs and harrows. A squad of men is to be assigned to every mile of the road. The trail enthusiasts in every town are to appoint one man for each mile as road boss. Women of each county will provide luncheons at noon and the enthusiasm has waxed so strong it is expected the women will have to provide also for farmers as far as 5 miles each side of the highway. They have been asked to lend a hand. The program includes patriotic music in every town by the bands, orchestras and thousands of school children.

COLORADOANS PLAN SHORT CUT

A movement to build a first-class road over the shortest feasible route between Denver and Fort Morgan has been started in Adams county by the organization of the Burlington County Highway Association of Adams County, with Henry C. Campbell as president and County Judge W. C. Hood, Jr., as secretary-treasurer. The proposed highway will follow closely the line of the Burlington railroad, by way of Hudson, and make the motoring distance from Denver to Fort Morgan only 80 miles, as against 95 miles via Ben-

nett or 117 miles via Greeley. Thus far this season the Greeley route is the only one open to travel between Denver and Fort Morgan, and the promoters of this new project claim they soon will have a road far better than the one by way of Bennet and a close rival of the Greeley road, which is nearly 40 miles longer.

The necessary right of way all through Adams county has been donated by several land owners, and work will be started at once to construct the new highway. There are already good stretches of road over parts of the route decided upon. The line will connect at Fort Morgan with a branch of the Lincoln highway, and is expected to swing considerable extra tourist travel into Denver from eastern points by this method.

WORKING ON KING EDWARD ROAD

Energy displayed to complete the King Edward highway before the summer tourist traffic commences has resulted in the federal government giving orders for the work to be taken in hand at once. A start has been made by the contractors to provide a temporary road passable at all times of the year, until such time as the new highway is completed. There is a section of 8,000 feet on the city side of Laprairie which remains to complete the King Edward highway from St. Lambert to the American border. This portion is over land which belongs to the federal government, the remainder of the highway having been constructed by the provincial government.

Answers to Many Inquiries for Route Information

Ann Arbor, Mich.—Madison, S. D.

ANN ARBOR, Mich.—Editor Motor Age—I am planning on driving from Ann Arbor to Madison, S. D., and would like a route outlined via Chicago and Des Moines.—T. A. Wadden.

A day's run to South Bend is through Chelsea, Jackson, Albion, Marshall, Battle Creek, Galesburg, Kalamazoo, Paw Paw, Dowagiac, and Niles. South Bend to Chicago is New Carlisle, LaPorte, Westville, Valparaiso, Hobart, Highlands, and South Chicago. The Chicago-Clinton, Ia., road passes through Geneva, DeKalb, Rochelle, Franklin Grove, Dixon, Sterling, and Morrison. Continue west to Cedar Rapids, passing through Elvira, DeWitt, Grand Mound, Wheatland, Lowden, Clarence, Mechanicsville, and Mt. Vernon, then run north to Mason City, over a section of the Red Ball route via Newhall, Vinton to Waterloo, then follows the Shell Rock river a large part of the distance to Mason City through Janesville, Shell Rock, Clarksville, Marble Rock, and Rockford. The North Iowa pike is now taken up as far as Sioux Falls, S. D. This is a dirt road dragged after every rain and you will follow it through Clear Lake, Algona, Emmetsburg, Ruthven, Spencer, Sheldon, Rock Valley, Canton, and Harrisburg. Madison is 51 miles distant and reached via Hartford and Chester.

The above outlined route is the most direct. In order to visit Des Moines, from Clinton drop down to Davenport and travel 194 miles by way of Pleasant Prairie, Muscatine, Fredonia, Washington, Harper, Springfield, Oskaloosa, Monroe, and Prairie

City. Going 92 miles to Fort Dodge via Madrid, Boone, and Dayton, turn 146 miles to Sioux City, touring through Pomeroy, Fonda, Storm Lake, Cherokee, Remsen, Le Mars, and Leeds, then Sioux Falls reached through Westfield, Hawarden, Fairview, and Canton, a run of 95 miles.

Buffalo, N. Y.—New York City.

Batavia, N. Y.—Editor Motor Age—I would like to procure road maps and touring information for the route from Buffalo to New York and return.—C. A. Spear.

Maps such as will be of the most assistance to you are contained in the Blue Book, volume 1, for this trip. The cost is \$2.50 but in addition to the maps it gives you running directions from town to town for this main road as well as many others, mileage, road conditions, points of interest, hotels, garages, etc. The popular highway extends through Batavia, Rochester, Syracuse, Utica, Schenectady, Albany, Poughkeepsie and along down the Hudson to New York.

Princeton, Ind.—Cincinnati, O.

Princeton, Ind.—Editor Motor Age—Please give me the shortest and best route to Cincinnati, O. Also tell me the price of the Blue Book.—J. W. Bagby.

Naturally the shortest route is Vincennes, Bedford, Seymour with the objection of hills and poor road beyond Loogootee for a short distance, much of it being avoided by a detour from the regular road. Otherwise you would have to go via Terre Haute, Bloomington, and Columbus, somewhat longer but through very pretty, wild country and interesting to look at.

You reach Vincennes through Patoka and

Hazleton, then turn east through Wheatland, Washington, Canalburg, Loogootee, Shoals, Mitchell, Bedford, Vandalia, Brownstown, Seymour, Nebraska, Dillsboro, Aurora, Homestead, and Cleves. This distance is 212 miles.

The longer and better route from Vincennes continues north through Bruceville, Carlisle, Paxton, Sullivan, to Terre Haute, thence southeasterly passing through Ashboro, Vandalia, Spencer, Ellettsville, Bloomington, Columbus, Hope, Greensburg, Batesville, Ashton, Yorkville, and Cleves. This route is 284 miles.

The Blue Books are each \$2.50 and it is the volume 4 which you will want for this trip.

Charles City, Ia.—Racine, Wis.

Charles City, Ia.—Editor Motor Age—I want to drive to Racine, Wis., crossing the Mississippi at Clinton, then working east and north to Racine. I don't object to going direct east from Clinton through Dixon, Rochelle, etc., if this is the best way, but want to keep out of Chicago.—F. W. Fisher.

Your route through Iowa to Clinton is as follows: Plainfield, Waverly, Janesville, Waterloo, Washburn, Vinton, Newhall, Cedar Rapids, Mt. Vernon, Mechanicsville, Clarence, Grand Mound, De Witt, and Elvira. Taking the Clinton-Chicago road as far as Dixon, going through Morrison and Sterling, turn north to Lake Geneva and route through Byron, Rockford, Belvidere, Harvard, Walworth, and Fontana. The last stretch to Racine is 42 miles via Springfield, Burlington, Rochester and Yorkville. All roads are good.

Ray Harroun's Maxwell Racers Are in Completed State

Description of the Indianapolis Speedway Cars



Teddy Tetzlaff, holder of the world's road racing championship, in the Maxwell racing car, which he will drive at Indianapolis. Note the air horn of the Harroun carburetor outside of the hood. At Tetzlaff's side is Harry Goetz, who probably will be mechanic or relief driver

By L. V. Spencer

UP in one corner of one of the plants of the Maxwell Motor Co. in Detroit, Ray Harroun and his corps of racing car mechanics have toiled incessantly for several months on the production of something new in the line of speed machines. It was on December 20 of last year that the idea of entering the May 30 races at Indianapolis was conceived by Walter E. Flanders, president of the Maxwell company, and on that date he entered into a contract with Harroun.

Harroun's Speed Contract

That contract called for the production of three speed cars of the same constructional features which would each make a lap of the Indianapolis speedway in 1:37. The track is 2.5 miles in length, and such a performance is at the rate of about 93 miles an hour. To design and build such machines in less than 6 months was no small task, but it has been all but completed.

Behind the canvas partitions of the "racing car department" of the Milwaukee avenue plant Harroun went to work. The public has been denied the

development period of his efforts, but now that one of his cars is on the road, the construction of the hopefuls of the Maxwell company is completely revealed.

Actual construction was commenced on the first of March, and on Friday of last week, the first of three cars emerged from its secluded nursery and its motor started to bark vociferously at the first turn of the crank.

Although the ability of the new cars has not yet been determined, they look to be exceedingly serious contenders for the laurels which Indianapolis has to offer at the end of the month.

Built upon a 104-inch wheelbase, which is the same as that of the stock Maxwell 25, the Maxwell-Harroun racing cars have motors of unusual construction whose bore is 4.2 inches and stroke 8 inches. These dimensions give a piston displacement of approximately 445 cubic inches and provide 140 horsepower at 2400 revolutions a minute.

Motor Has No Flywheel

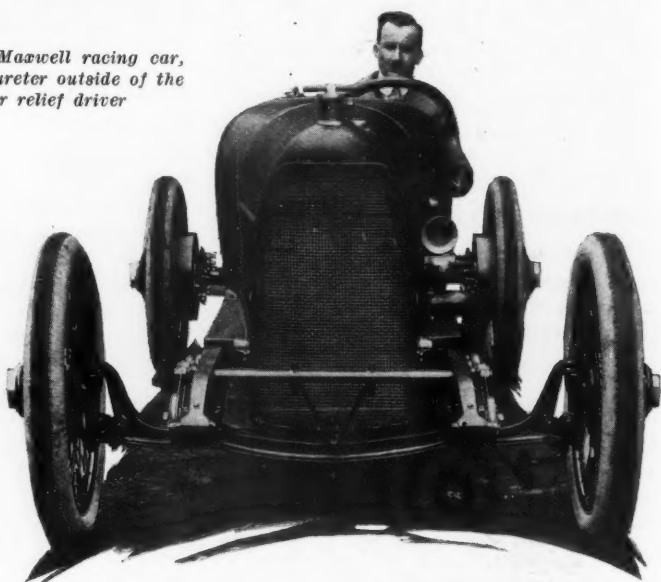
The motor easily is the feature of the cars, although remarkable refinement of detail and careful attention to every constructional point is very noticeable.

With clutch and accessories, the complete motor weighs about 650 pounds, and perhaps the most unusual part of it is the fact that there is no flywheel, at least, not in the ordinary accepted sense.

The flywheel effect, however, is obtained by the counterbalancing of the crankshaft opposite to the connecting rod throws. Thus the flywheel function is distributed along the entire length of the crankshaft and exceedingly fine mechanical balance is the result.

Method of Counterbalance

The counterbalance weight opposite each of the connecting rod bearings is equal to the weight of the lower part of the connecting rod and its bearings so that all of each portion of the moving parts revolves in the same plane. This



William Carlson at the wheel of the Maxwell racer which Ray Harroun is building for his mount at the International 500-mile race. In this forward view of the car the air horn of the carburetor may be seen pointing forward to utilize the wind pressure in improving carburetion. Also note the unusual front suspension

gives to the crankshaft an unusual appearance, as shown in the illustration.

The cylinders are cast in one block and have very large water-jacket space so that efficient cooling may be readily obtained. The cylinder head is detachable and carries the overhead valves, which are operated by a single camshaft above them. The exhausts and intakes are on opposite sides of the engine and very clear and short passages communicate with the manifolds.

The camshaft drive is by means of a vertical shaft running upward from spiral gear connection with the crankshaft to another spiral gearset at the camshaft. Both of these gear units are completely inclosed, while there is a universal joint at either end of the vertical shaft to allow for any slight variation in relative position of any of the component parts.

The camshaft is carried on three main bearings and operates the valves through intermediary rocker arms, pivoted for exhausts and intakes on opposite sides of the



Bevel gearing in the rear axle of the Maxwell racers. There is no differential

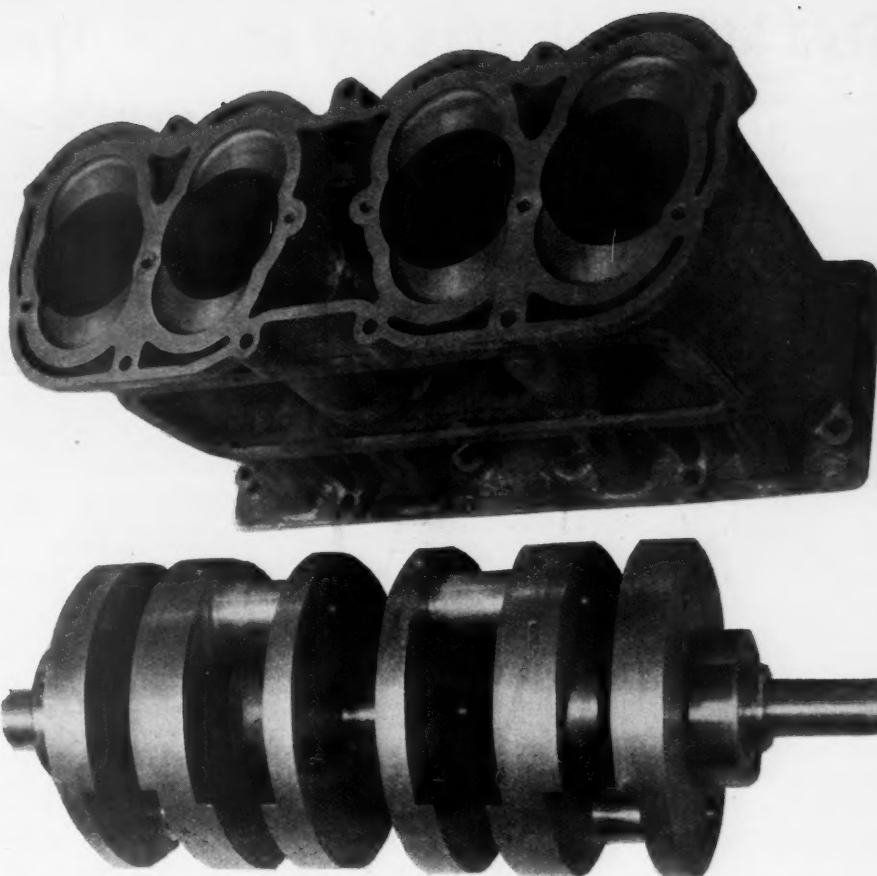
inner walls of the containing housing in the cylinder head. In order to get both intake and exhaust cams on the same shaft, the set of two valves for each cylinder are offset from one another $1\frac{1}{4}$ inch. This allows the two cams to be arranged side by side and also gives plenty of room for the operating of the rockers.

The valves operate against springs in the usual way and have a clear opening of $2\frac{3}{4}$ inches. The intakes are on the left and the exhausts on the right. The whole valve mechanism, camshaft and drive are completely inclosed by an aluminum plate which caps the cylinder head.

Ball-Bearing Crankshaft

Throughout the power plant ball bearings are used with the exception of the center main bearing of the crankshaft and the connecting rods. These bearings are all double row annulars of Rhineland make. The two main crankshaft bearings are self-aligning, which is another efficiency factor. These main end bearings are Nos. 6312 and 6311, rear and front, respectively, while the center bearing measures $2\frac{1}{2}$ inches in diameter by a length of 3 inches. One of these double row annulars is also located next to each spiral gear on the camshaft drive.

Connecting rods and pistons of these Harroun Maxwells are very interesting, for the reason that they are constructed of metals not usually associated with such parts. The pistons are made of a very light, but exceedingly strong, alloy known as magnalium. They weigh 17 ounces, while the ordinary cast iron piston of the same dimensions would tip the scales at between 4 and 5 pounds. Such material reduction of reciprocating parts is a great factor in increasing the power. These pistons are each fitted with two compression rings and one retainer ring for the

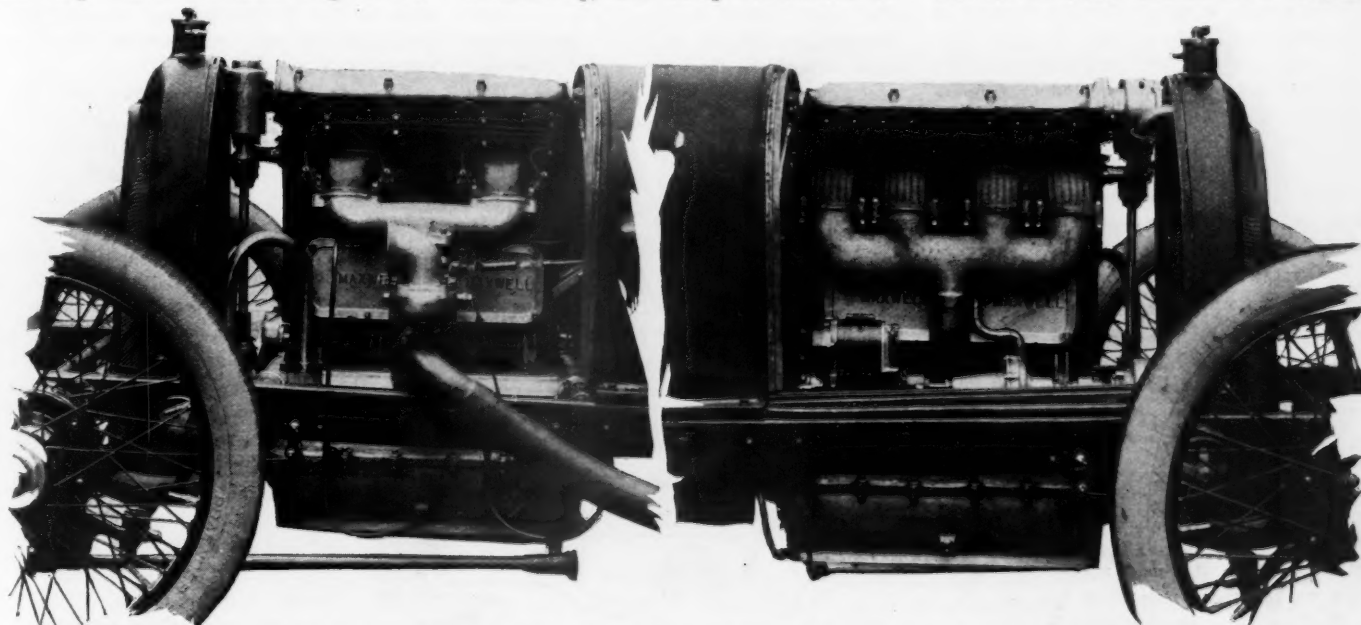


Crankshaft and cylinder casting of the new Maxwell racers built by Ray Harroun. Above is shown the block cylinders with the head removed. The half-moons on either side of the cylinder bore correspond with the valve seats, each of which open up nearly one-half of the top of the cylinder. The valves are operated by a single camshaft which runs over the cylinder heads, and is driven by a vertical shaft, with spiral gears. Below is the crankshaft whose design is such that no flywheel is used. In fact the flywheel is the crankshaft itself, thus the flywheel weight is distributed along its entire length instead of being concentrated at one end of the shaft as in the ordinary practice

wrist pin. All rings have a width of $\frac{1}{8}$ inch and are constructed of steel.

The connecting rods are examples of fine workmanship, and being constructed of

chrome-vanadium steel have great strength. The usual I-beam rod section is preserved, but further strengthening is obtained by the web on either end of the I section.



Intake and exhaust sides of the Harroun Maxwell racers. One of the outstanding features of the design is the unusual size and strength of the manifolds and the inlet and exhaust connection. The intake manifold at the left is a double branch affair and the upper portion is a part of the cylinder head casting. The exhaust manifold at the right has a separate lead to each valve, but is split horizontally in the same way. The upper portion is ribbed to assist in cooling. Notice that the exhaust pipe passes between the cylinders to the intake side to the bottom of the carburetor, all of the exhaust gas passing around the carburetor before being released

Four bolts hold the strap on the lower end in place, while the wrist pin is loose on the upper end of the rod. The lower bearing has a diameter of $2\frac{1}{4}$ inches and a length of 3 inches, and the wrist pin is $\frac{3}{4}$ inch in diameter.

To secure the best possible balance due to uniform compression in all cylinders, the compression chambers are finished over all inside and polished. This insures the same size of each chamber.

The motor has a novel oiling system. Instead of the usual arrangement for the pumping of oil into the crankcase, Harroun has provided a method whereby the lubricant moves in the opposite direction in its cycle from tank to engine and must be pumped out of the bearings. Thus, there is assurance that the supply will not be shut off. The bearings may get too much oil, but they cannot get too little.

Novel Oiling System

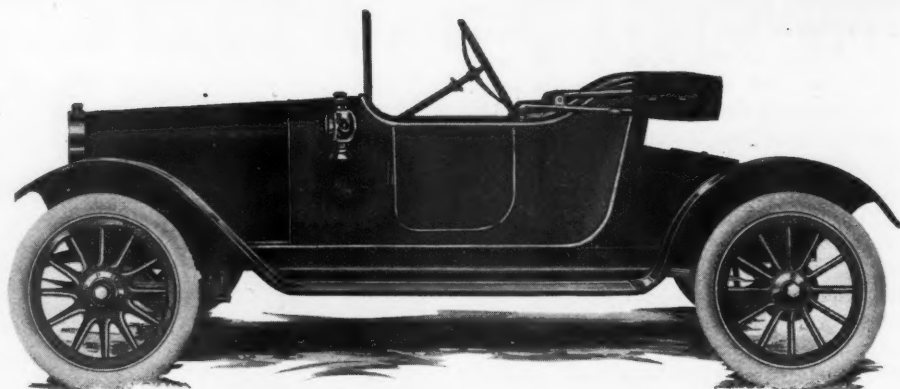
The oil system is essentially a force-feed pressure type circulating through the hollow crankshaft. It is pumped direct to the center main bearing from the rear tank by means of a gear-driven pump. The center main bearing is made of the plain type in order to get a packing joint for the introduction of the oil to its center.

In the oil system there is a by-pass valve which is regulated from the dash. The lubricant by-passing through this check valve goes up through the hollow camshaft and out through the little holes in each of the cams, lubricating the cam rocker surfaces and cam surfaces. This oil then drains into the valve housing and thence is conveyed back to the tank. This flow back to the tank effectively cools the oil ready for recirculation.

One other unusual constructional feature of the engine is the method of support in the chassis. There is cast integral with the upper half of the crankcase at front and rear a for mof projection or tubular lug through which passes a hollow steel tube running to the frame. This makes an exceedingly strong and rigid mounting, and its general arrangement may be clearly seen in the view herewith of the upper half of the crankcase.

As to the ignition, Harroun prefers the single-point type and has placed the spark plugs diagonally in the left side of the cylinder head and at either side of the inlet port, which takes care of each two cylinders. Being in this position, the plugs are waterjacketed. A Bosch magneto on the right side of the engine and driven by shaft from the rear end of the water pump shaft takes care of the ignition.

Back of the motor there



BODY OF NEW REX ROADSTER WHICH HAS NOVEL DRIVE

is a separate gearset of three speeds which gets its power through a disk clutch of standard type. The drive shaft has two universals, while the drive and the torque are taken through the rear springs. These are the first American racing cars to place the torque and drive on the rear springs, but it is in accord with some of the practice of foreigners, notably Peugeot and Delage.

The rear axle has a pressed steel housing, but there is no differential, a straight bevel gear and pinion construction connecting the power positively from motor to rear wheels. This, of course, is not new to racing machine construction.

The tank, 32 gallons capacity for gasoline and 12 for oil, is hung on trunnions and has three-point support, allowing for any frame weaving without springing any of the tank seams or bending it. There are two front supports and one at the rear of the tank.

Braender 34 by $4\frac{1}{2}$ tires on Houk wire wheels are part of the equipment. Another equipment feature is the use of a tachometer for registering the motor speed instead of a speedometer for car speed. Thus, the driver can at all times know the performance of his motor, and knows from experience approximately what engine speed corresponds to a certain car speed.

The total weight of the Maxwells is about 2,100 pounds and, of course, their speed possibilities are not yet fully known. But Teddy Tetzlaff and Billy Carlson are now in Detroit to find out a few things about them. Just who will drive the third car has not been fully decided, but negotiations are under way with Hemery and others, and it is certain that a star will be secured.

Rush Work on Others

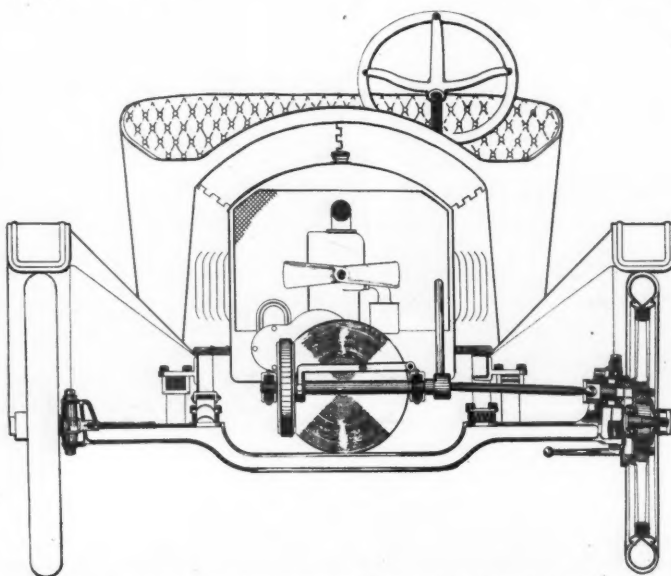
Although only one of the cars is now on the road, the other two will also be completed by the 15th. Number 1 will shortly be shipped to Indianapolis. All three will be painted gun metal and red, with the former color predominant.

NOVEL DRIVE ON THE REX

A light car of very unusual construction is being built by the Rex Motor Co., Ford, Mich. A side-by-side standard-tread vehicle of more or less conventional lines, its unusual feature is its transmission arrangement. This car drives from one front wheel, through the medium of spur reduction gearing and a friction change speed, arranged to operate on the face of the flywheel, which in this case is at the front of the motor instead of the rear.

The car has a 100-inch wheelbase, 28-inch wheels, with 3-inch tires, and a four-cylinder block motor $2\frac{3}{4}$ by $4\frac{1}{2}$. Stevens ignition system is fitted, and a mechanical starter.

The transmission of the power is direct from the friction disk in front of the motor to the left front wheel. It is claimed that this arrangement has an advantage in securing ample traction and yet eliminating expensive construction and the differential. Freedom from skidding also is claimed and said to be due to the fact that the propelling power is a pull instead of a push. Thirty pounds of weight per horsepower is claimed. The car is said to be capable of from 40 to 45 miles per hour. It sells at \$425.



SINGLE FRONT-WHEEL DRIVE OF REX CAR

New R. C. H. Equipped With Cone Clutch Instead of Disk

Streamline Body Adds to the Appearance

THE revamped R. C. H. Corp., Detroit, Mich., has brought out a car which is radically different in appearance from the car which previously bore the name of R. C. H. The new R. C. H., which is illustrated on this page, is a thoroughly up-to-date proposition involving the sloping hood and modified streamline body, which has come to be recognized as exemplifying the latest in design. The power plant and running gear does not differ materially from the construction of previous years, but is modified to meet the needs of the more roomy and more handsome appearing body of the present car.

Motor Little Changed.

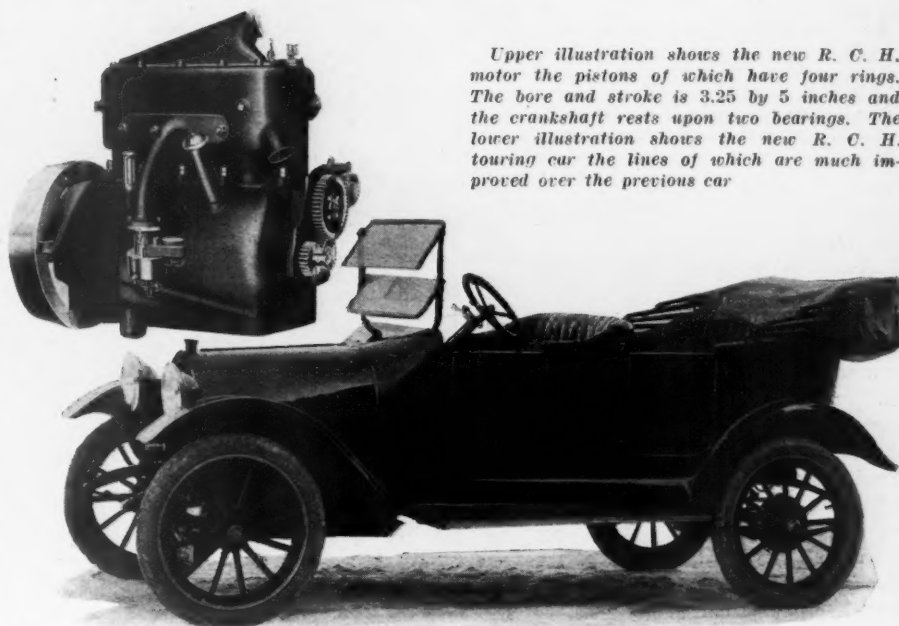
The appearance of this motor has not been altered and it is in fact the R. C. H. power plant of old. It is distinguished by its block-cast cylinders with large water manifolds bolted on the exhaust manifold and, in a word, by its simple exterior appearance. The motor is a 3.25 by 5-inch, with a thoroughly compact arrangement of cylinders, due to the method of casting in block and by the use of a two-bearing crankshaft.

One of the features of the R. C. H. is the use of four piston rings on each piston. This gives a steady guide action and takes up the thrust from the 9-inch connecting rods. The crankshaft is 1.875 inches in diameter and carries the same diameter at each of the crankshaft bearings. The motor is suspended from the chassis at three points, one support being at either side of the crankcase at front and one at the center in the rear.

The valve action is accessible by removing the cover plates, which are shown on the right side of Fig. 1, in which one of these plates are removed. The diameter of the valve is 1.125 inches and the lift .25. Adjustment on the valve tappets are made by means of hexagonal nut on the bottom of the push rod. This is reached through the side cover plate. The main and lower connecting rod bearings can be reached through large cover plates in the side wall of the crankcase.

Cooling is a thermo-syphon system. The motor is oiled by means of splash, the oil being conveyed from the reservoir in the base of the motor by an oil wheel operated by a friction ring from a disk on the crankshaft. By this means oil is conveyed to ducts on both sides of the crankcase and then into troughs under each connecting rod, where it is picked up by the connecting rods' scoops and thrown to the cylinder walls and also to the other internal bearings of the motor.

The fuel system is by gravity to a BD carbureter which is especially designed to meet the needs of this motor. This carbureter and its mounting on the intake manifold are illustrated on the left side



Upper illustration shows the new R. C. H. motor the pistons of which have four rings. The bore and stroke is 3.25 by 5 inches and the crankshaft rests upon two bearings. The lower illustration shows the new R. C. H. touring car the lines of which are much improved over the previous car

of Fig. 1. It is shown between the oil filler opening and the oil level gauge on the crankcase. Ignition is by Bosch magneto and is a single system.

Clutch Now a Cone.

The clutch is a leather-faced cone type with the leather held in place by drop-forged T-bolts. The old R. C. H. had a dry-plate clutch. The engagement springs which are provided under the facing allow a smooth start and the main clutch springs are three in number, each provided with an adjustment feature for regulating the tension. The clutch throw-out is a long forged yoke, operated in connection with ball thrust bearings. In order to facilitate easy gear changes the clutch is provided with a brake which checks the spinning action when declutched. The clutch hub sleeve is adjustable, allowing for

changes between that and the universal joint shaft.

Power is delivered through a three-speed selective gearset geared direct on third and providing on direct drive a reduction of 4.25 to 1 through the rear axle. The reduction on second speed is 8.5 to 1 and on first speed is 13.8 to 1. The brakes are 10 inches in diameter and have a 2.25-inch facing. They act directly on a drum bolted to the rear wheels. The wheels are 32 inches in diameter, carrying 3½-inch tires.

Body work and equipment are a step in advance over previous R. C. H. cars, the 110-inch wheelbase and the general low-hung appearance of the car giving a graceful effect, which is more typical of American design than the previous R. C. H., which strongly favored foreign light cars in appearance. The car is sold at \$900.

Sale of Knox Assets to Sutton Approved

Mayo Interests in Control at Springfield

SPRINGFIELD, MASS., May 2—Despite the fact that Attorney John P. Wright, of Boston, representing creditors, made objections, Referee Charles W. Bostwick approved the sale of the Knox company to Edward O. Sutton yesterday for a total of \$631,090. Mr. Wright stated that he would file with Judge Morton, of the United States district court at Boston, a petition for a revocation of the adjudication in bankruptcy.

Mr. Sutton represents the Mayo interests, to which the Knox company owes large sums. The case came before Referee Bostwick in the form of three petitions

from the trustee, asking that he give his approval of three sales of practically all the property of the company. Mr. Sutton's bids were \$200,340 for the real estate, \$180,750 for the machinery and equipment of the plant and \$250,000 for the balance of the property. The only other bid was \$325,000 for the property exclusive of the real estate.

Attorney Gardner stated that in addition to the bid of Mr. Sutton there are assets not sold, in the form of cars to deliver, cash and receivables, which will total \$146,000, making a grand total of about \$777,000.

Half a Million Fords Make Wide Market for Specialties

History of Organization and Growth of Detroit Company

MORE than one-half million Ford cars have been built and sold by the Ford Motor Co. The 500,000 figure was passed in April and the big factory at Highland Park, Mich., was speeded up so that cars were being turned out at the rate of more than 1,100 a day as the half-million milestone was left behind. This was but a continuation of the pace set in March, when for twenty-six consecutive working days the daily production exceeded 1,100 cars. There were more than 30,000 cars turned out in the Ford factory during the month of April. On April 27, 1,300 cars were completed.

In 1903 the Ford Motor Co. was established. It was a fortunate organization in that it combined rare inventive and creative genius coupled with substantial ability and integrity. Fundamental in this organization was the fixed determination to build a car that should be as simple, practical and economical as human ingenuity could devise, to the end that it might be a thing of use and service to the greatest number of users and not a mere luxury.

From the beginning the Ford car ob-



PRODUCTION OF FORD CARS FOR EACH OF THE 12 YEARS SINCE THE ORGANIZATION OF THE COMPANY. THIS EXPLAINS THE MARKET FOR FORD SPECIALTIES

tained a distinctive recognition. And as the manufacturing facilities, the efficiency of the car and the volume of its output increased the cost of its production automatically decreased. Hand in hand with

the development of the car itself and its production methods the distribution and sales system was perfected so that as great economies are effected in getting the completed car to the owner as there is in building it in the first place.

In more than 6,000 cities and towns throughout the world Ford cars and Ford parts are for sale by agents. In forty-six of the larger cities of the world are located direct branches of the central organization at Detroit, and in connection with sixteen of these are assembling plants to which the cars are shipped partially assembled and there put together in their final form. This effects an enormous saving in freight and steamship charges and is only one of the means by which great production is utilized to create a low cost to the consumer.

The history of the Ford Motor Co. is one of rapid but consistent expansion, and is a monument to that business enterprise possible only in America and probable only in an industry of rapid expansion like that of the motor car. On June 16, 1903, the Ford organization was undertaken with



A PART OF THE 16,000 PEOPLE THAT TURN OUT FORD CARS AT THE DETROIT PLANT



MAP SHOWING LOCATION OF CONCERNS MAKING FORD ACCESSORIES. THREE TOWNS WHERE SUCH CONCERNS ARE LOCATED ARE NOT ON THIS MAP; THESE ARE MARSHALL, TEX.; LOS ANGELES, CAL., AND DENVER, COLO.

a capital stock of \$100,000. In 1904 a factory of $\frac{1}{4}$ -acre floor space was occupied and a little over 300 employees were at work in producing the 1,700 cars which was that year's output. Even at that date the Ford sales policy was evident because the first branch house was established in the first year of production.

In 1905 the floor space of the factory had increased to $1\frac{1}{2}$ acres and an average of 518 workmen were employed, introducing the 1,700 cars of that year's output. The number of branch houses was increased to eight. In 1906 the factory floor space had increased to 78,000 square feet and the average number of employees was of 518 workmen were employed, produced to 1,600. One branch house was added, bringing the number up to nine. In 1907 the factory was again increased in size to a floor space of 91,500 square feet, and the average number of employees to 14,427. This was a year of expansion because 8,759 cars were built as against 1,600 the year before, and four branches were added.

In 1908 the capital stock was increased from \$100,000 to its present figure of \$2,000,000, and the factory floor space was almost trebled, being nearly 260,000 square feet, employing almost 2,000 workmen. In spite of this expansion in capitalization and factory capacity, or perhaps because of it, the production was slightly less than that of the year before, being only 6,181. The number of branch houses was increased by one.

Rapid Expansion

The year 1909 saw the beginning of the big-scale production, a total of 10,660 cars was turned out. The new Canadian factory was built across the river from Detroit, increasing the factory floor space to 425,000 square feet. Two assembling plants were built in that year, which marked the beginning of the policy of shipping the cars knocked down to be assembled locally. Twenty-two hundred em-

ployees were at work, 10,660 cars were built and the number of branch houses increased to twenty-two. The production was doubled in 1910, 20,000 Fords being turned out that year. In 1911 the production increased to 35,000 cars and in 1912 it again doubled to 76,150.

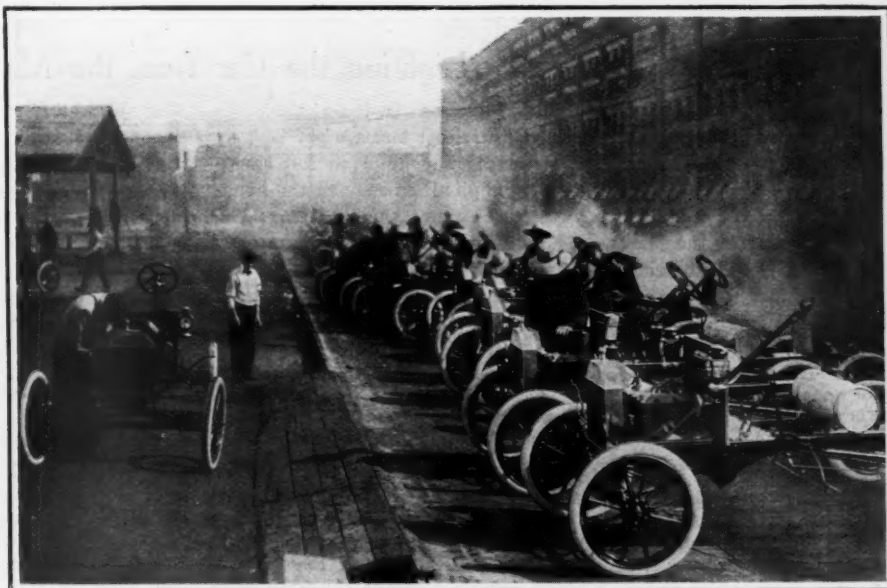
Establishes English Factory

At the close of 1913, 187,000 Ford cars had been built during that year. This was more than double the output of the previous year and was more than one hundred times the production of 1905. The factory facilities had been expanded by the completion of a modern plant in England, so that the combined factory floor space of the Detroit, Canadian and English factories was almost 2,400,000 square feet, and the floor space of the sixteen assembling plants was even greater. On the average 16,000 employees found steady work at the Detroit plant. The number of branch houses is forty-five. Ford expects

to build 250,000 cars during the present year.

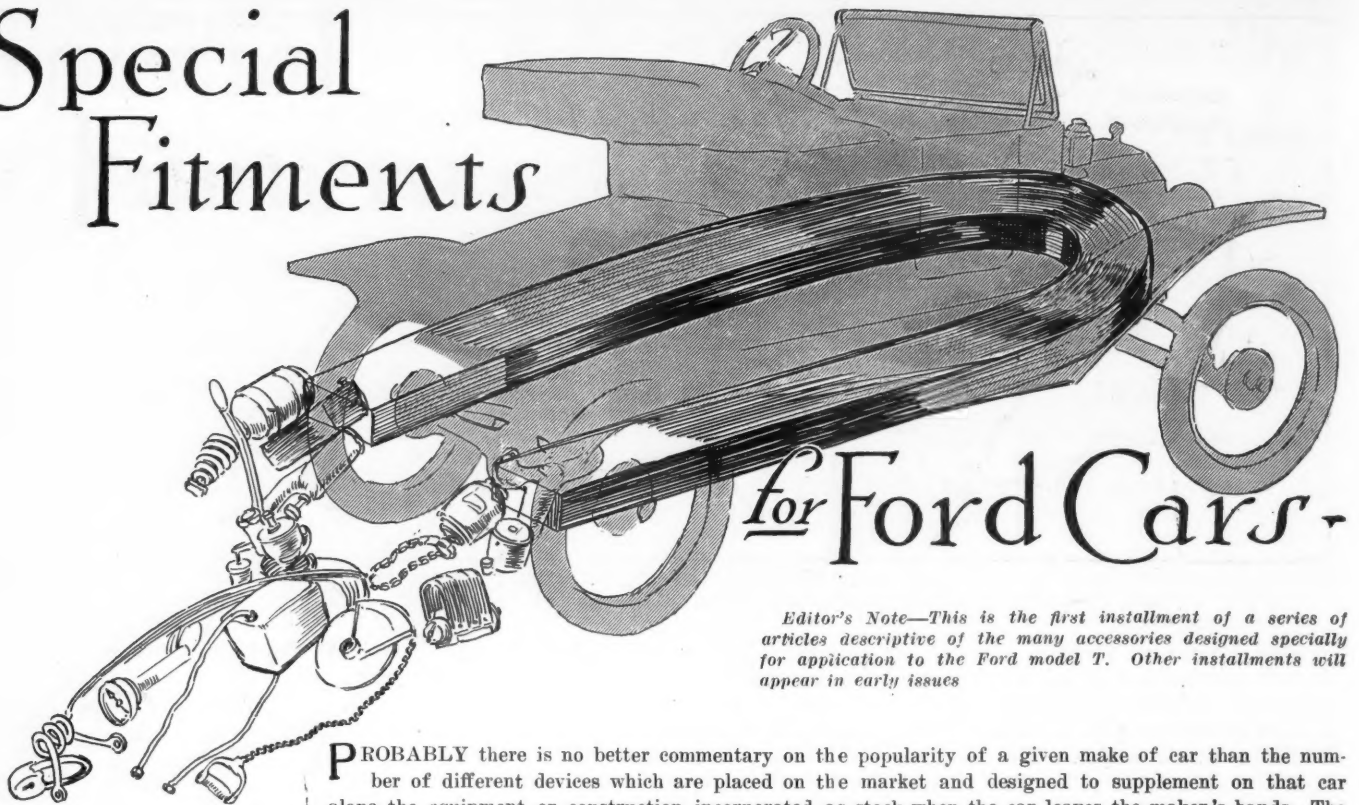
The half-million cars have been sold in every country of the globe where a motor car could possibly run. Fords may be found in the interior of darkest Africa, in the valleys of the Andes of South America, in Ceylon, in the Philippines and in all of the out-of-the-way places of the world. The company's slogan, "Every third car is a Ford," is practically true nearly everywhere.

The fact that there are so many cars identical in every respect produces an almost unlimited market for accessories designed for that one car alone. These can be produced much more cheaply than can similar ones, which must be arranged to fit a number of cars which are mechanically different. Consequently, the selling price of the Ford specialties can be made low enough to appeal to the class of buyers that own that car.



TESTING 1,200 FORDS A DAY AT THE FACTORY

Special Fitments



Editor's Note—This is the first installment of a series of articles descriptive of the many accessories designed specially for application to the Ford model T. Other installments will appear in early issues

PROBABLY there is no better commentary on the popularity of a given make of car than the number of different devices which are placed on the market and designed to supplement on that car alone the equipment or construction incorporated as stock when the car leaves the maker's hands. The thoughtless are wont to assume from the fact that the market is flooded with special attachments for a particular car, that that car necessarily must be lacking sadly somewhere if all these specialties are called for.

Such, however, is not usually the case. In most instances it means that there are so many of these cars in service that the supplementary market among owners will make profitable the production of a device adapted to one car alone and the creation of a demand for it among the owners of that car. Particularly is this true in the case of the scores of special devices designed for Ford model T cars.

With close to 1,200 new Fords taking the road every day it is a safe assumption that a profitable percentage of the new owners will want something different from the stock equipment, if for no other reason than to make the cars different from the Fords of their neighbors. Manufacturers of these specialties have found a profitable field among Ford owners, not because the car, as it leaves the factory, is not complete, but because most of us are not satisfied with necessities, but must have something extra in the way of luxuries.

The popularity of this car has resulted in firms other than the Ford company, producing a host of special equipment and parts for replacement or attachment to the regular product. These specialties are designed for all parts of the car, from the starting crank to the rear axle and from the wheels to the top.

For the benefit of Ford owners, representative types of the various specialties for the model T are illustrated and described on these pages. It is well to consider, however, before investing in these that the installation of many of them automatically invalidates the Ford guarantee, also that the car as a whole was designed for the equipment supplied by the maker. Haphazard installation of extras sometimes impairs the efficient operation of any car, and the car rather than the accessories often is given the blame.

Lighting the Car from the Magneto

FORD owners in general are much interested in the methods for procuring electric illumination of their cars and are particularly fortunate in that in the Ford magneto they have an inexhaustible source of current which may be applied directly to the headlights without impairing to any great extent the ignition. The most popular of the electric lighting systems for Ford cars electrify the two headlights only, the current being taken directly from the magneto so that no extra source of supply is required.

These outfits are quite inexpensive as they consist only of re-

flectors, bulbs, switch, connectors, and some comparatively short lengths of wire. The reflectors are arranged to be inserted in the acetylene headlights. Only two connections on the car are necessary, one terminal being connected to the switch from one headlight to the terminal on the magneto. The other headlight is connected on one side to a ground on the lamp bracket bolt or other convenient ground, the two lamps being connected in series usually. The bulbs usually employed are 6-volt, 12 to 16-candle-power tungsten bulbs, although 12-volt bulbs in parallel are used.

Outfits of this sort are supplied all ready for quick installation by a number of concerns. These include the American Auto Supply Co., Chicago, whose outfit with a kick switch is sold for \$3.95; Emil Grossman Co., New York, listed with 8-inch reflectors at \$3.45 and \$3.60 in nickel and silver respectively and 9-inch reflectors at an advance of 15 cents; Fitzgerald Mfg. Co., Torrington, Conn., whose outfit consists of two brass reflectors, silver plated, a detachable handle switch, Ediswan sockets, oil proof cable cut to correct lengths, insulated

staples and a roll of tape; the Excelsior General Supplies Co., Chicago, whose outfit is listed at \$7.50, as is that of the R. C. Hull Electric Co., Cleveland, O., and the Auto Parts Co., Providence, R. I., which lists a similar outfit at \$3.50; the Motor Car Equipment Co., New York, at \$8.50, and the K-W Electric Co., Cleveland, O., at \$15, including complete lamps.

Magneto lighting outfits are made in three types by the Vesta Accumulator Co., Chicago. These range in price from \$3.80 to \$13.50. The two cheaper ones include reflectors for the

gas headlights together with the necessary bulbs, wire, switch, etc., ready to install. The \$13.50 outfit has a pair of acorn type electric headlights equipped with bayonet lock connectors.

A new Ford lighting outfit involving a patented reflector is marketed by the A. H. Kling Co., Detroit, Mich. These reflectors are silver-plated brass instead of steel, but the special feature is that the back of the reflector is removable so that it is unnecessary to remove the entire reflector in replacing burned-out

bulbs. Ease of installation is assured by a complete wiring harness. The outfit, including a flush switch, costs \$5, with \$1 extra for an Edison base tungsten bulb. The Gibson Automobile Co., Indianapolis, Ind., supplies a magneto lighting system with special headlights

at \$14 and outfits without headlights, but with the parabolic reflectors, from \$10 to \$17. Some of these comprise the Gibson regulating switch, a \$5 instrument.

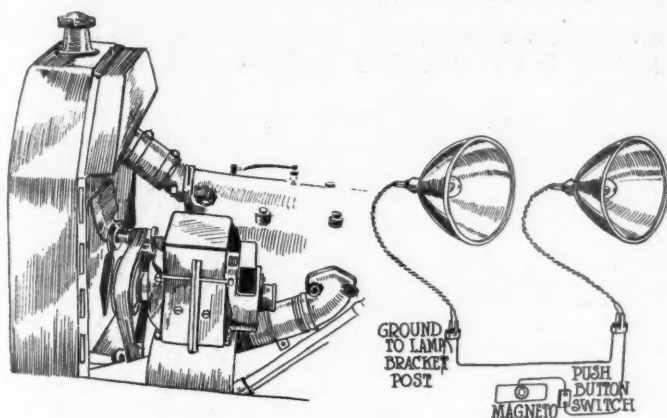
A complete outfit designed to be installed at small cost is made by E. A. Hammer Co.,

Cleveland, O. Two types of magneto lighting systems are made by the Auto Parts Co., Chicago. One system is listed at \$4.30, the usual outfit of bulbs, wiring and reflectors are supplied, while in the other one listing at \$14.40 special bullet type headlights are supplied.

To Keep the Headlight Bulbs from Burning Out

THERE is one difficulty that is met with in using the magneto as a source of current for the headlights, and that is that the magneto, being designed for ignition only has the property of generating higher voltage as the speed increases so that above 30 or 35 miles per hour the lamps often burn out. It is true also

that at low speeds the magneto does not generate sufficient current to make the lamps brilliant. To get around this difficulty there have been one or two regulating devices put on the market which are intended to prevent the excess of current going to the lamps at high speed.



DYNETO LIGHTING GENERATOR WIRING OF MAGNETO HEADLIGHT OUTFIT

These devices not only prevent the burning out of the lamps, but also permit bulbs of slightly lower voltage to be used so that a good driving light may be had at lower speeds than is possible without them. One of these

should anything go wrong with the regular lighting system. It is supplied at an additional cost of \$1.50.

A similar regulator is the Lite-Controller. The device embodies a choke coil, which gen-

erates sufficient back pressure to prevent the light from burning out. Three steps are provided. It is sold at \$3.00 and is manufactured by the American Battery Co., Chicago. Another regulator of this type is made by D. W. McVean, Noblesville, Ind. This, it is claimed, gives a good light at 5 miles per hour, and may be installed by anyone in 30 minutes and sells for \$1.50. To reduce the brilliancy of the light for city driving, the Post & Lester Co., Hartford, Conn., is making a controller known as the Dim-Down. It is operated by the driver's foot and lists at \$3. A small instrument designed to dim or brighten the headlights is announced by the Suburban Lighting and Gas Engine Co., Toledo, O., under the name of Dimmit. The device itself may be placed on the dash and is controlled by hand. The face of the instrument is fitted with a switch and various notches so that the headlights may be operated at full voltage or at intermediate pressure. It is especially applicable to Ford cars and sells for \$2.50.

Ford magnetos generate alternating current and for this reason storage batteries cannot be used in connection with them unless some means for changing alternating into direct current is employed. A rectifier for this purpose is manufactured by the American Battery Co., Chicago.

Special Generator and Battery Lighting Systems

TO have light when the engine is not running and keep from the additional loading of the magneto occasioned by the use of part of its current for the headlights, the storage batteries sometimes are employed to supply the current. These systems may consist of the battery alone, which is recharged at intervals, or

it may consist of a battery which is kept charged by a small generator driven by the engine. The advantages of these systems are that they provide constant current when the motor is running or standing, and also the current may be in use for lighting all the other lamps on the car as well as the headlights.

One such generator and battery system is the Dyneto, made by the Dyneto Electric Co., Syracuse, N. Y.; another is manufactured by the Fisher Electrical Works, Detroit, Mich.

Another is the Kemco fan generator, which combines a fan and an electric generator. It is mounted just behind the radiator and assists in cooling the motor as well as supplying the lights. It is manufactured by the Kemco Mfg. Co., Cleveland, O.

One K-W Ford lighting system has a separate magneto driven by the engine and which supplies current for the lights. The outfit includes the generator, headlights, wiring and switches. Another K-W outfit may be had without the generator to use the Ford magneto for current.

A 2-volt generator and battery lighting system is produced by the Vesta Accumulator Co. at \$38.50. The generator is very light and is a miniature of the standard 6-volt Vesta generator. The battery has one cell of large capacity. Besides these, the outfit includes a pair of reflectors for the headlights, with bulbs, a fitting and bulb for the taillight, a complete wiring outfit made up inclosed in loom with all connections made and switches attached, battery box and fittings for the installation and belt drive of the dynamo.

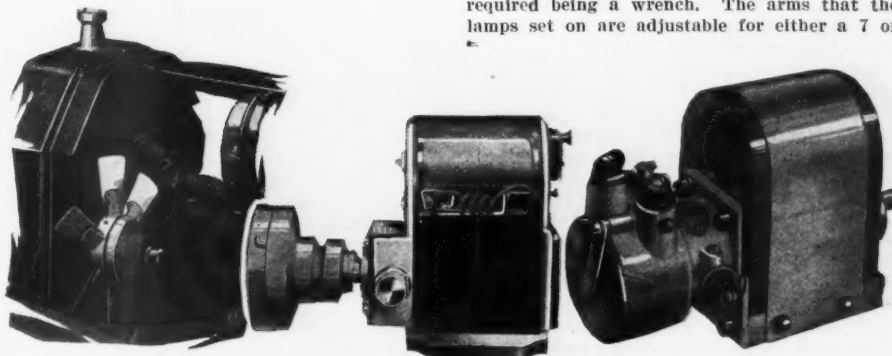
A late one of the generator systems is the New Lite, just announced by the New Lite Mfg. Co., Newton, Ia. It comprises a self-regulating generator driven by the fan belt, and LBA stor-

age battery and steel box, headlights, taillight, dimmer, switches and wiring. It is stated that the system can be installed in 2 hours. It sells for \$40.

The latest electric lighting outfit for Fords is that of the Hendricks Novelty Co., Indianapolis, Ind. This consists of a magneto type generator, which is belt-driven, together with special fittings, wiring and lamps which make installation easy. The outfits are of different capacity and they vary from \$20 to \$50 in price.

To be able to have the headlights follow the direction of the front wheels in turning a corner often is considered an advantage. The Headlight Support Co., Detroit, Mich., has brought out an arrangement by which the headlights are turned automatically when the front wheels are turned. A revolving post to which the headlights are attached attains this result and costs \$10.00.

Another dirigible headlight bracket for Fords is the Seetall made by the Seetall Mfg. Co., Des Moines, Ia. This is of quite simple construction and is easily installed, the only tool required being a wrench. The arms that the lamps set on are adjustable for either a 7 or

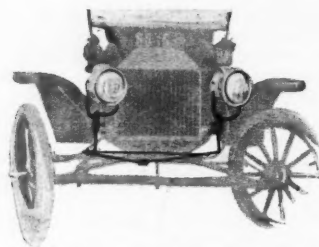


THREE LIGHTING GENERATORS

At left, Kemco fan generator; center, New Lite; right, Vesta 2-volt generator

9-inch lamp. The swivel is ball bearing, making a rigid joint but one that turns easily. The push rods telescope against a $5\frac{1}{2}$ -inch compression spring, thus making a cushion designed to take up all vibration of the car body to make the lights ride steadily. Brass is used in these rods to prevent rusting and thus retain good appearance.

A combination trouble light and dash light for Ford cars is made by the Franklin Specialty Co., Worcester, Mass. It is called the De-Lite and consists of an Ediswan socket mounted on the dash with the standard type of dash light bulb and a 10-foot extension



SEE IT ALL DIRIGIBLE HEAD-LIGHT BRACKET

cord, to which the lamp may be attached when used as a trouble light. It operates on two dry cells and is listed at \$3.00. A dash lamp which operates upon one dry cell is listed at \$1.50 by the Auto Parts Co., Providence, R. I. for Fords.

The Metal Specialties Mfg. Co., Chicago, is making a cigar lighter designed for operation from the magneto. This is called Presto, and with its holder sells for \$2.50. It is also manufactured as a combination trouble light and cigar lighter. Another type with an automatic cord winder costs \$5. It is designed to wind up into its case.

Ford Engine Starters—Mechanical, Electrical and Pneumatic

TO have an engine which will start from the seat is one of the elements of refinement which appeal to Ford owners as forcibly as to those who drive more pretentious vehicles. Motor starters have a particular appeal where there are women drivers in the family. Most of the cranking devices for the Ford car are of mechanical design.

Electrical starting systems similar to those employed on larger cars offer the advantage that the electric lighting of the car is

obtained by the same system. Some of these systems have been produced in a form specially adapted to cheap installation on the Ford.

Another type of engine starter is the compressed-air type in which the motor is made to store air under pressure in a tank, the air then being released into an air motor when it is desired to start. One of the advantages is that the compressed air thus provided always is at hand for tire inflation as well.

The Detroit starter is operated by a lever beside the emergency brake. This lever is connected with a sector and pinion gear just in front of the dash and the operation of starting is performed directly on the crankshaft. A primer is supplied to facilitate the starting of the engine, and each pull of the lever gives the motor a quarter turn. Its weight is 20 pounds. It may be had from the Detroit Mechanical Starter Co., Detroit.

Another starter designed for the Ford is the Knapp, a compression spring starter operated by a pedal which turns the engine direct on the magneto. The Knapp starter costs \$25.00 and weighs less than 50 pounds. It is manufactured and sold by the Fawkes Auto Co., Minneapolis, Minn.

The Bremer-Wilson Mfg. Co., 1421 Michigan avenue, Chicago, has a starter for Ford cars priced at \$9.00. It is out of sight, under the hood; all that shows is a small hand lever on the dash. To start it is only necessary to pull on the handle near the dash. The handle is attached to a cable communicating with a pawl-and-ratchet device at the front end of the motor. The installation is simple and the original starting crank remains in commission.

A mechanical pull starter is the Sandbo, made by the Sandbo Co., Bennet, Ia. This comprises a dash handle in connection with a cable led through a pulley and metal tube to a spider attached to the frame in front of the radiator. The dash handle fits into a metal socket when not in use, and one sharp pull, it is said, cranks the engine. The apparatus weighs 8 pounds and installation is easy. It sells for \$20.

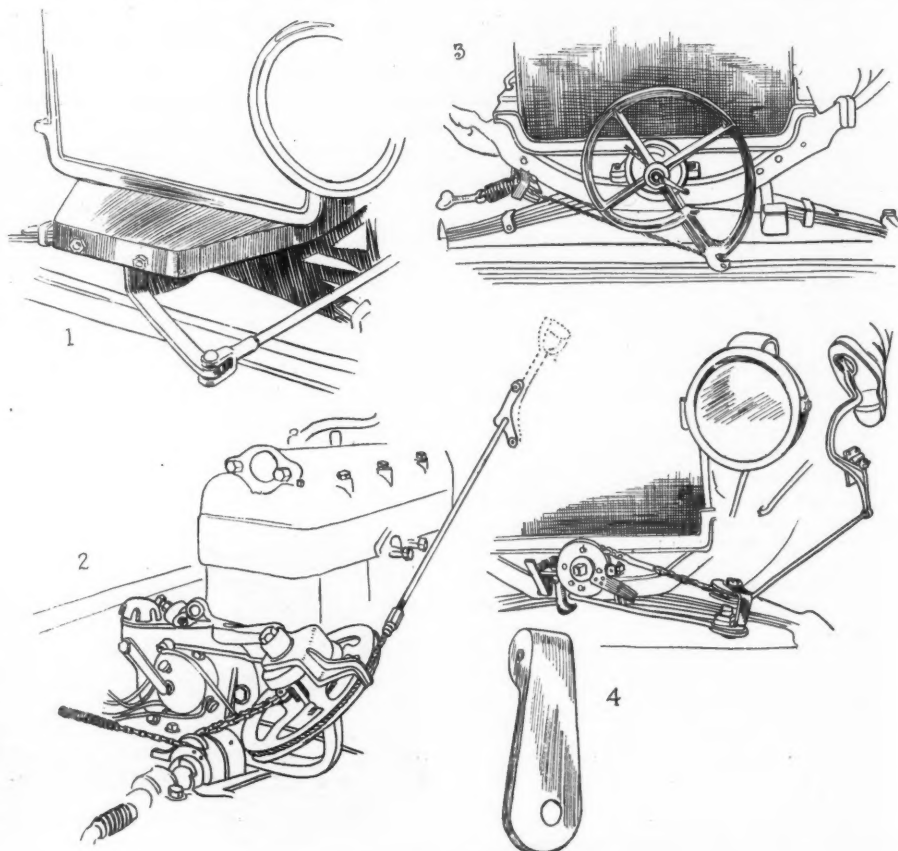
Similar to the pull starters, but operated by a pedal, is the Mesnard, made by the Modern Auto Starter Co., Chicago. The engine is turned by a cable passing over a pulley which replaces the crank handle. The cable is operated by a pedal in the driver's compartment. The apparatus is light, simple and easily installed and is not expensive. A similar one is the Standard, made by Pettibone & Torland, Chicago. It sells ready to install at \$27.50.

The Housel starter is a mechanical device attached on the forward end of the crankshaft by a pawl-and-ratchet arrangement and operated by pedal which, when depressed, imparts one-third revolution to the crankshaft. The starter is mounted behind the radiator. A fan-belt wheel is attached to the crankshaft in place of the one regularly fitted, and this wheel with the lower cog and hand-crank attachment are compactly installed. A flexible steel cable connects the starter arm with the pedal. The starter is sold by the Housel Mfg. Co., East Rochester, N. Y., at \$25.

Starters of the spring type differ from those

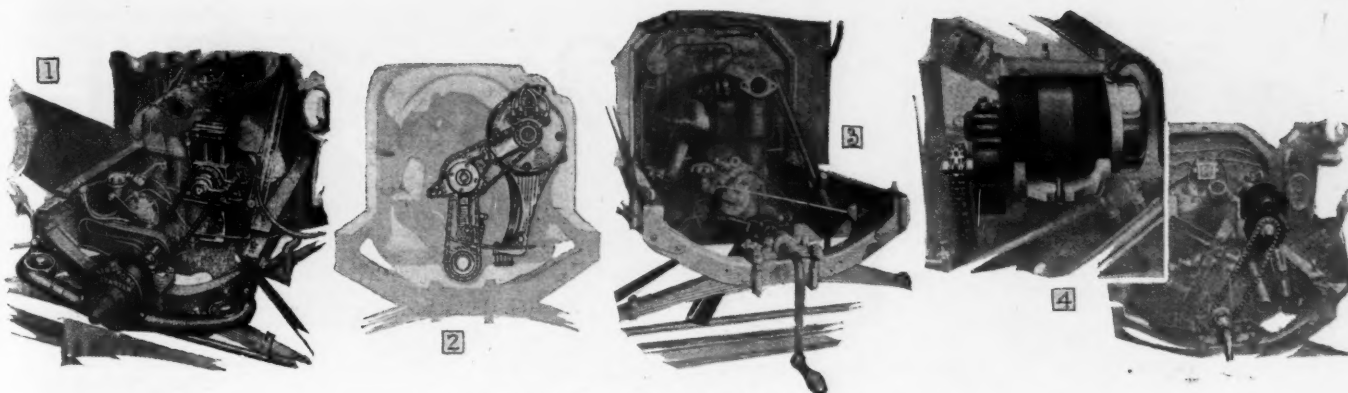
just described in that the engine itself stores up the power by which it subsequently is cranked. The rotation of the crankshaft in ordinary running winds up a spring which when released by the pressure of a foot button whirls the engine over rapidly. Such an one is the Ever Ready, made by the American Ever Ready Co., New York. It is attached in front of the radiator and takes the place of the starting crank. It is about the size of a headlight and looks like a headlight reversed.

A starter of the spring type is the Gardner, made by the Gardner Engine Starter Co., Chicago. This one is inserted in the transmission system, and the only part visible is the foot button which operates it. It is so arranged that after the start connections automatically are established for rewinding the spring.



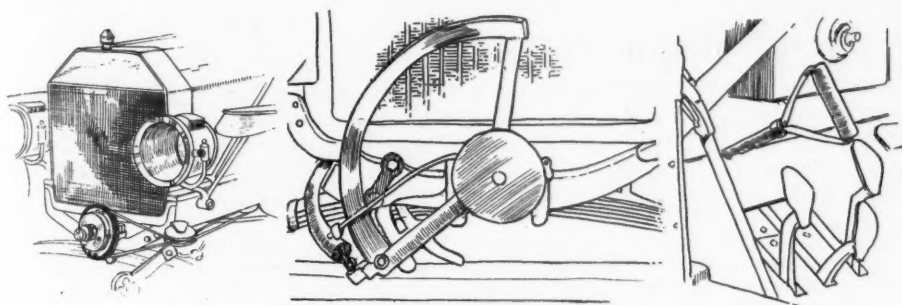
SOME MECHANICAL STARTERS FOR FORDS

1, Detroit; 2, Boston; 3, Sandbo; 4, Perfection



THREE VARIETIES OF CRANKING INSTALLATIONS

1, Kellogg Air-Ford starter; 2, North East cranking and lighting 3, Housel mechanical starter; 4, Deaco electric cranking and lighting



TO CRANK FORD FROM SEAT

At left, Modern; center, Bridges; right, Bremer-Wilson

be applied by the owner of the car and that without drilling a hole or altering any part of the engine. With a slight change in the starting crank it may be left in position.

One of the first concerns to market an electric cranking and lighting system for Ford cars is the Northeast Electric Co., Rochester, N. Y. The Ford apparatus consists of a motor-generator driven by silent chain from the crankshaft of the motor, suitable accessories such as brackets and fastenings, and a battery. In operation, pressure on a pedal causes the Ford engine to start, because the battery current flows through the cranking motor. When the engine picks up its cycle the pedal is released and the generator comes into play charging the battery.

A simple starting and lighting system for Ford cars is announced by the Detroit Electric Appliance Co., Detroit, Mich., which the owner of the car may himself install. A motor-generator driven by silent chain supplies the current when the car is operating at sufficient speed, but at low speeds, or when the motor is stopped, a battery attached to the running board furnishes the current. Pressure of the heel upon a pedal sends current from the battery to the starting motor, which in turn cranks the engine. All the terminals are marked in some way and the wires cut to exact size, so that if the instructions are followed the installation becomes a simple matter.

The Leece-Neville Co., Cleveland, O., has produced an electric starting and lighting system for Fords, designed for quick installation. The Gray & Davis Co. has announced a starting-lighting system for this car, which is very compact and can be installed in a few hours by any garageman. The feature of the system is that the Edison storage battery is used, by which means a lighter and more compact battery is obtained than is possible with the more common lead plates.

The Kellogg Mfg. Co., Rochester, N. Y., has brought out the Kellogg Air-Ford starter, with simplicity, efficiency and moderate cost as the aim. The Kellogg-starter is built under the Durno pattern. A four-cylinder Kellogg air pump is mounted conveniently upon the motor

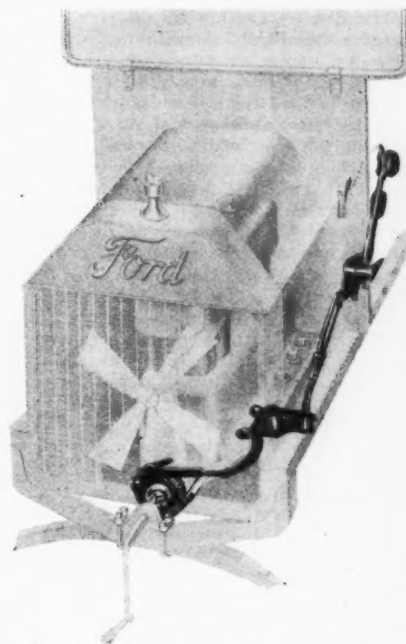
and driven by chain from a gear on the forward end of the crankshaft; this stores air in the storage tank, which upon the pressure of a button on the floor board is released to a starting cylinder which drives backward a piston in that cylinder, pulling a chain over a sprocket on the crankshaft.

The motor is turned so fast that one impulse turns it over several times. A spring returns the drum and prepares the starter for a second application of power. The outfit is supplied ready for attachment on the Ford at \$70.

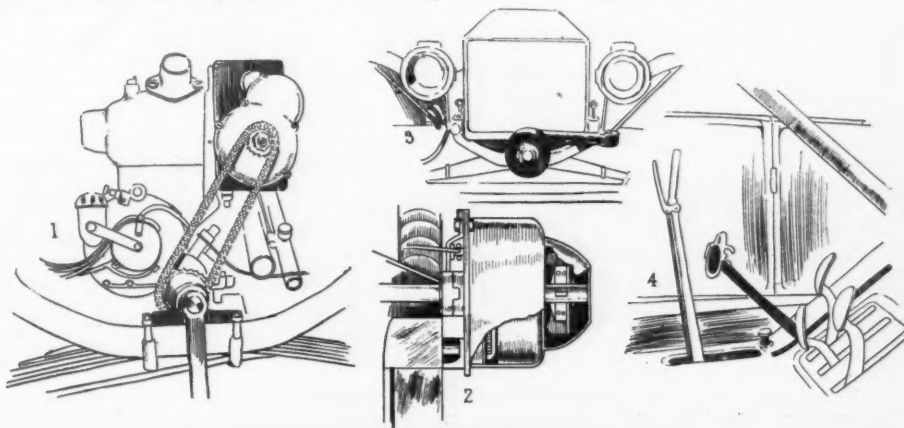
The Gemmer-Detroit Starter Co., Detroit, Mich., has a new air-starter system in which a single instrument performs the function of both the air compressor and the air motor. This combined motor-compressor is in reality a four-cylinder air pump mounted on the engine and driven from the timing gears. When running as a pump it stores up compressed air in a special tank which may be released either for tire inflation or for engine cranking. When air from the storage tank is admitted to the combination unit it runs as an air motor connected to the crankshaft of the engine by gears. Thus it spins the crankshaft at a speed of

about 200 r. p. m. The total weight of the system is about 35 pounds. A special installation has been developed for Ford cars, designed with a view to quick application.

To make starting easier, whether it is done by hand or by other means, there have been a number of special Ford designs provided. One of these is an outfit of injector bolts fitted with priming cups, made by the Romé Light Co., Chicago. They are specially drilled bolts which replace four of the bolts which hold the cylinder head. They sell at \$2 per set.

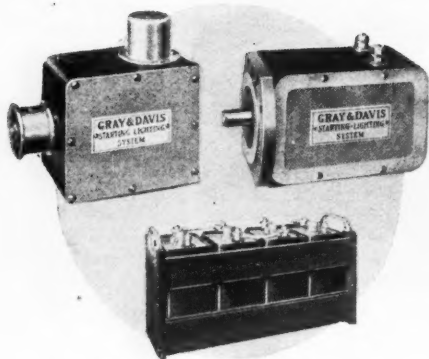


STANDARD PEDAL STARTER

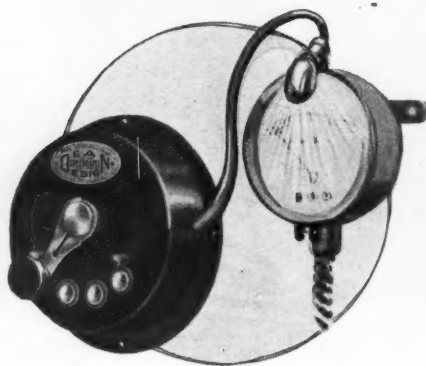


FORD STARTER OUTFITS

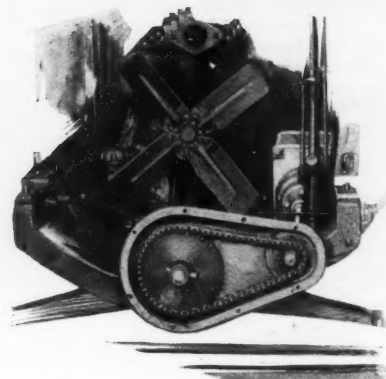
1, Fisher electric cranking and lighting; 2, Ever Ready spring starter; 3 and 4, Knapp starter



UNITS OF GRAY & DAVIS LIGHTING AND STARTING SYSTEM



DEAN REGULITE AND SPEEDOLITE FOR FORDS



LEECE-NEVILLE ELECTRIC LIGHTING AND CRANKING EQUIPMENT

Special Magneto Outfits

THE characteristic four-unit coil ignition system employed with the Ford low-tension magneto is open to more or less criticism at the hands of Ford users. This is due chiefly to the difficulty of keeping all four coils adjusted properly.

The most recent and most radical of the methods for obviating

this difficulty is the installation of an extra magneto of the high-tension type in which no coils are needed. In addition to assuring regular ignition, this arrangement permits the stock Ford magneto to be employed for the purpose of lighting alone and relieves it of the drain of the ignition current.

Four magneto concerns have come to the front within the past 6 months with special high-tension magnetos designed for quick and inexpensive installation on this car. One of these is the Bosch Magneto Co., which supplies its regular DU4 magneto with special bracket and driving arrangement for application to the Ford engine; the other is the Splittdorf Magneto Co., whose new Ford magneto is different from any of its previous products.

The chief difference between the two installations is that one, the Bosch, is driven by silent chain and the Splittdorf is direct gear driven. By the use of a high-tension magneto on Ford cars the four-unit coils are dispensed with and the flywheel magneto supplied with the car may be used for a lighting generator.

Installing these high-tension magnetos in Ford cars is not the work of an expert, both concerns issuing full instructions and giving all the necessary fittings. These instruments are said to give an efficient spark at exceedingly low engine speeds and may be used safely without a battery system, for one quick turn of the crankhandle is sufficient to give the motor an initial start.

The feature of the system is the simplicity and ease of attachment and also that no important parts need be removed nor any drilling done. The Bosch when installed is driven by silent chain from the commutator shaft and the magneto itself is mounted on a bracket so that the top of the magneto is on a level with the top of the cylinder casting.

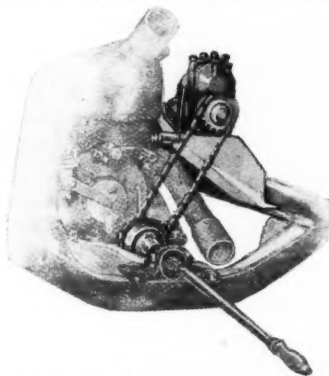
The price of the Bosch-Ford system complete is \$70.

The Splittdorf-Ford magneto is gear driven and the gears are inclosed. The magneto itself is said to be waterproof and dustproof, and special care has been taken to make the instru-

ment simple in construction. The base, to which the pole pieces are secured, is of aluminum and the armature revolving between these pole pieces operates on two annular ball-bearings. The magneto circuit breaker is on one end of the armature shaft and revolves with it.

Marburg Bros., Inc., New York, is the American distributor for the Mea magneto, one type of which, the A-4, is sold for equipment on the Ford car. A special method of installing the instrument is to be placed on the American market shortly by this company. The instrument has a stationary housing together with the Mea feature of shifting field so that the spark is the same throughout the entire range of timing. The stationary housing makes the magneto waterproof.

By an ingenious system of replacing standard parts with special ones the Eisemann Magneto Co., Brooklyn, N. Y., has evolved a method



MEA SPECIAL MAGNETO INSTALLATION FOR FORDS

of attaching a standard Eisemann magneto to a Ford motor without the necessity for doing any machine work or other fitting. The parts are so marked that when put together on the motor in accordance with instructions, the magneto is properly timed, and it is not necessary to have an expert knowledge of magneto timing methods. It is pointed out by the manufacturers that the magneto and drive attachment can be installed by anyone in a few hours.

The outfit consists, in addition to the magneto, of a new gearcase cover to take the place of the Ford timing gear cover, magneto bracket which is cast integrally with the cover, driving gears, switch, special control rod, cable bracket and small accessory parts. The outfit is supplied for single or dual ignition, in which case a dash coil forms part of the equipment.

When the Eisemann dual system is used a small mechanical vibrator makes it possible to start the motor on the ignition, provided there is gas in the cylinders. The vibrator is enclosed in the upper part of the switch casing and is turned by means of a thumb-button. The price of the outfit with high-tension magneto is \$50 and of the dual system \$55. Every part that is required to make the change is included.

Installation of a Remy magneto on the Ford engine is made particularly easy by an outfit produced by the Western Automobile Supply Co., Omaha, Neb. The equipment includes a new model R-L Remy magneto and coil, together with fittings, which comprise a driving gear and cover, an attachment plate, timer control rod, switch and minor fittings. The outfit is listed at \$56.50 and an allowance of \$10 is offered for the oil coil box, which the equipment supplants.

Master Vibrators, Timers and Unit Sparkers

A SIMPLER and less expensive method of eliminating the troubles due to the four separate coils in the ignition system is by the installation of a master vibrator. This arrangement utilizes the four coils as transformers but the rapid interruption of the current necessary for the transformer effect originally obtained in each of the four vibrators separately, is cared for by a single extra vibrator, the original ones being short-circuited.

The man does not live who can adjust four separate vibrators exactly alike and if he did he would soon die of nervous prostration from trying to keep them adjusted. Improper or unequal adjustment means that the cylinders are getting the sparks in

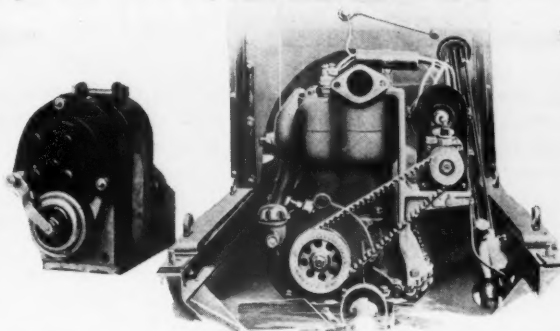
"rag time," that explosions are unequal. This means waste of fuel, heating, and loss of flexibility and pulling power. Master vibrators all work on the same principle and differ only in materials and workmanship, though some of them are arranged to put on the dash with the regular coils and others simply project through the dash. The installation is of the simplest and there always are complete directions for the mounting and the simple wiring connections necessary. In connection with repairs to the master vibrators, it is well to warn users to be sure to get repairs made by the same concern that produced the instrument, particularly in the matter of the contacts and springs.

Among the instruments of this type are those made by the K-W Ignition Co., Cleveland, O., complete with switch at \$15; the New York Coil Co., New York, with switch at \$10; R. C. Wells Mfg. Co., Fond du Lac, Wis., with switch at \$10; Briggs & Stratton, Milwaukee, Wis., a cartridge type with switch, for which the Fulton-McCutchan Co., Chicago, is distributor, at \$10. The Auto Parts Co., Providence, R. I., has three styles, one with switch and removable key at \$10, a cylindrical one without switch at \$8 and a smaller and simpler one at \$6.

The American Coil Co., Foxboro, Mass., features an unusually small and compact instrument in a metallic case at \$6 with an extra charge of \$1 when the switch is incorporated. The Connecticut Telephone and Electric Co., Meriden, Conn., features a horizontal cartridge type in which only the kick switch is visible. This sells at \$9. With the reduction of the points of adjustment from four to one in the master vibrator, the Lisle Mfg. Co. has gone a step farther and removed that last one. Its instrument is a small horizontal metal-cased affair, which is nonadjustable. Though made primarily for magneto current, it can be connected with batteries by installing a small two-point switch. It lists at \$10.50. The Gibson

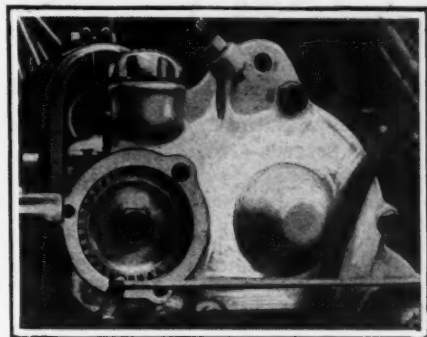
regard for the needs of this car. With switch, it sells at \$25.50.

The Heinze Electric Co., Lowell, Mass., is said



AT LEFT, SPLITDORF MAGNETO; AT RIGHT, BOSCH INSTALLATION

Six dry cells or a 6-volt storage battery take the place of the magneto. It is stated with this the Ford can throttle down to 3 miles



EISEMANN MAGNETO OUTFIT COMPLETE

to gain the same result in its special four-unit coils by the use of a patented adjustment feature, which prevents the units ever getting out of adjustment. The coils themselves are specially designed for Ford flywheel magneto and silk wire is used exclusively in the secondary. The set is furnished upon the receipt of the old one and \$15.

Unisparkers and Timers

Another method by which this is accomplished is by the installation of a unisparker, a special model of which the Atwater Kent Mfg. Co., Philadelphia, Pa., has produced for Ford cars. The operation of this system is too well understood to need elucidation here. Suffice it to say that the manufacturer has developed a special standard by which the instrument may be attached without machine work. It consists of a distributor elevated to an accessible position, which takes the place of the Ford timer, and a single non-vibrating coil, eliminating the four-unit coils. Six dry cells last for 2,000 miles, it is stated. Price, \$28.

The Blitz sparker is said to be of the unit sparker type, having a head which contains the contactor, a breaker, an arm operated by a four-pointed ratchet, and the distributor. Only one of the vibrators of the coil box is used, the others being out of circuit, so the effect is the same as if a master vibrator were employed. The distributor is on an elevated shaft, whose gears fit on the timer shaft and run in oil. It is listed at \$20. It is made by the Blitz Electric Specialty Mfg. Co., Omaha, Neb.

The New York Coil Co. features the Rhoades ignition system for Fords. This operates in connection with the Ford ignition and consists of a unit sparker or distributor elevated.

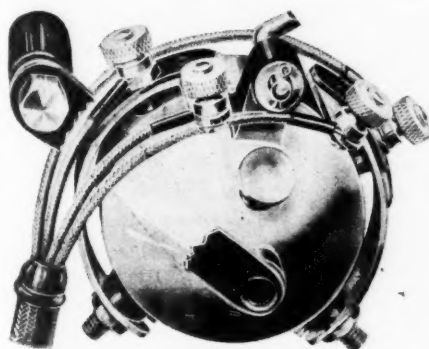
per hour on high. The complete system sells for \$30.

The Ford Parts Specialty Co., Richmond, Ind., makes equipment for elevating the timer by which the work may be done by any one with a wrench in 1 hour. It sells for \$7.25, and extra timers may be obtained for \$2.50. Likewise the Atlantic Machine Co., Brooklyn, N. Y., manufactures an elevated timer bracket for Fords. It is designed to fit on the front crankcase cover, the lower spiral gear fitting on the end of the camshaft in place of the revolving center of the timer and the elevator shaft between the fan belt and the crankcase. It is stated that the bracket can be put on in a few minutes without drilling or making any alterations in the engine. It sells at \$7, and extra timers at \$2.50. The American Auto Supply Co., New York, has a vertical elevating timer bracket at \$7.25.

The Milwaukee Engine and Supply Co., Milwaukee, Wis., has brought out special timers for Fords, which are handled by most of the supply houses. The list price is \$4.

A new terminal especially adapted for the Ford timer has been brought out by the Pedersen Lubricator Co., New York. These are called the United terminals and are designed to bring all the wires on top of the timer, preventing them from getting oil soaked, with consequent short circuiting. The outfit also prevents twisting or straining at the terminal connections. Connecting or disconnecting the wires is accomplished easily without removing the timer, and it can be seen at a glance if the connections are properly made. The terminals are supplied at 50 cents a set.

(To be continued)



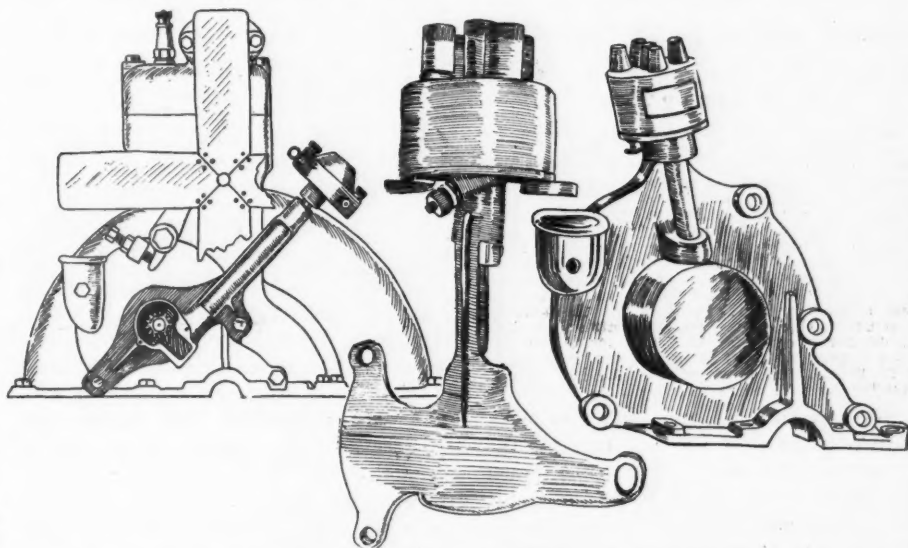
UNITED TIMER TERMINALS

Automobile Co., Indianapolis, Ind., markets three styles, ranging from \$10 to \$16 in price.

A new master vibrator for Fords which has a mechanical adjustment which can be made by a novice in a moment, is made by the Brown Co., Syracuse, N. Y. A Puritan switch is used which has a detachable handle, thus making the car thief-proof. E. Edelmann & Co., Chicago, manufacture the Jumbo master vibrator to sell at \$7.50.

The K. W. Ignition Co., Cleveland, O., has special coils for Ford cars, in fact some of the K. W. coils are standard equipment for the Ford. The auto synchronous spark coil is designed to prevent the need of a master vibrator, as according to the maker it is practically impossible to get them out of time no matter how badly out of adjustment they may be. For use with other coils, the K. W. Ignition Co. has a master vibrator which is sold complete with kick switch for \$15.

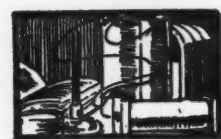
A metal cylindrical master vibrator for Fords is manufactured by the Alderman Mfg. Co., Inc., Rochester, N. Y. The special feature of this master vibrator is the condenser which is designed to prevent burning of the platinum points. The Menominee Electric Mfg. Co., Menominee, Mich., makes a master vibrator listed at \$7.50. A kick switch with removable key lock is supplied at 50 cents additional. It is listed at \$5. Kingston Ignition specialties for Ford cars made by the Kokomo Electric Co., Kokomo, Ind., include a four-unit dash coil which has been constructed with special



ATLANTIC TIMER ELEVATOR AT LEFT; ATWATER KENT UNISPARKER IN CENTER, AND BLITZ SPARKER AT RIGHT



The Readers' Clearing House



RACING INFORMATION FOR IOWAN

Wilcox, in a National, Drove 1 Mile in 40.32 Seconds—Indianapolis Stars

LOVILIA, Ia.—Editor Motor Age—What is the speed of the following engines: Overland 79, Buick 25, Ford, Continental six?

2—What is the speed of an Overland roadster model 79?

3—Did the Overland company ever build any six-cylinder machines, or do they now build any sixes?

4—What is the maximum speed of the Chalmers big six, Mitchell big six, Jeffery six and Buick 25?

5—What is the weight, wheelbase and piston displacement of the 300-horsepower Flat racer, with which Duray obtained a speed of 142.9 miles per hour?

6—What is now said to be the fastest car entered in the 500-mile race at Indianapolis?

7—What is the fastest time ever made by an American racing car?

8—What is the fastest stock car now built in the United States?—A Reader.

1—The engines you name with their speeds in r.p.m. suffixed follow: Overland 79, about 1,800; Buick 25, 1,800; Ford, 1,750. The Continental six motor used on the Moon will show close to 2,000 r.p.m.

2—Over 50 miles per hour.

3—The Overland company is not building a six now. It built the Willys six marketed some years ago.

4—The cars you name, with their approximate speeds in miles per hour, follow: Chalmers big six, 60; Mitchell big six, 60; Jeffery six, 60; Buick 25, over 45.

5—The weight and wheelbase is not known. The displacement is 1,900 cubic inches.

6—This is not known definitely, but the foreign Sunbeam and Peugeot, judging from past performances, are the fastest.

7—The fastest time made by an American car, as recorded by the A. A. A., was made by Wilcox in a National. He drove 1 mile in 40.32 seconds at Jacksonville in 1911.

8—The Mercer and the Stutz, two-passenger cars, can show 75 miles per hour and over, which appears to be the limit.

CASING BLOWS OVER THE RIM

Tires Are Being Operated Under-Inflated—Screw Bolts Up Tightly

Hubbard, Ore.—Editor Motor Age—I have a Buick two cylinder model F, tires 30 by 4, front and rear. The front tires stand round with 30 pounds of air in them. I have taken out the retaining bolts and carry 40 to 45 pounds of air and have no unusual trouble. The rear tires have retaining bolts and give trouble by blowing over the rims when I try to carry over 55 pounds of air in them.

2—Are retaining bolts of any advantage?

3—What is the best thing to do with a small sand or mud swelling on the side of the tire? One of my friends claims it is best to plug the entrance hole and leave the dirt in the pocket, for if it is cut out, four times out of five, the piece of rubber that is vulcanized on will come loose.—E. A. Porter.

1—The reason you are having so much trouble is because you are running the tire far below running pressure. A 4-inch tire should be pumped to at least 80 pounds pressure and not 45 or 55. Evidently the tire walls in all the cases you mention have become cracked and

so weak that almost any low pressure would blow the bead over the rim. If you will pump the tires to 80 pounds' pressure and screw the retaining bolts up tightly, your trouble will vanish.

2—Yes, they hold the bead more firmly to the clinch of the rim.

3—Under no circumstances should you leave the dirt in the swelling. The best thing to do when the tire is blistered is to have the bad spots vulcanized. The very mention of blister tells one you have been running the tire under-inflated, which shortens tire life considerably. Read the tire maker's instructions more fully and you will not have so much trouble.

VARIED INFORMATION FOR READER

Eight and Twelve-Cylinder Cars Abroad—Ford Carburetion

Chicago—Editor Motor Age—In Motor Age, issue of January 1, there was published a large list giving specifications of all important American motor cars. On page 36 of that issue, under the head of carburetion and under the sub-head is hot air pipe fitted, for the Ford car, the answer is yes, and under the sub-head, make of carburetor, the answer is optional.

In Motor Age of April 16, XYZ, of Mt. Carmel, Ill., asks "How does the Ford accomplish perfect carburetion without either?" that is, without hot-water jacketing or hot-air connection. Is XYZ wrong in assuming that the carburetor is of Ford make, and that it is without heating; or is Motor Age's list of January 1 in error in indicating that carburetor make is optional, and that hot-air pipe is fitted? In answer to XYZ it says that the carburetion in the Ford is by no means perfect. It seems to me that exhaust gas analysis would show that combustion is fairly perfect; therefore carburetion must also be reasonably perfect. Then, too, it would seem that there must also be other important compensation advantages in the Ford treatment of carburetion; otherwise heating arrangements would not be omitted. How is this?

2—Does the Fiat carburetor use any heating arrangements? From what I have read of it I should judge that it does not.

3—With eight or twelve-cylinder V-type engines, does each cylinder in one row fire simultaneously with a cylinder in the other row?

4—I have read that the De Dion company make a car with an eight-cylinder V-type engine. I have also read that the Sunbeam company make a twelve-cylinder V-type aeroplane engine. Is the engine of the twelve-cylinder Sunbeam racing car also V-type?

5—Are there any other cars made with multi-cylinder V-type engines?

6—In a recent number of Motor Age I noticed much advertising by the Lexington-Howard company calling special attention to its exhaust manifold arrangement. The term Moore multiple exhaust system is used as if it were some original or exclusive feature. I am under the impression that the Packard company and others have been using a very similar arrangement for some time. Is this not so?

7—I notice many racing cars using ordinary exhaust manifolds. Is there any good reason why all racing cars should not have each cylinder exhausting individually, using no exhaust manifold at all?—J. B. McQueeney.

1—The 1914 Ford car uses a hot-air connection, but the reader in his question referred to his own car, which no doubt is one of early make and is not fitted with a hot-air connection. The Motor Age specifications are correct when stating optional under make of carburetor for both Holley and Kingston instruments are used.

2—The Fiat carburetor has no hot-air connection.

3—The exact firing order is not known

at present, but will be published in this department as soon as the information is received.

4—The engine of the twelve-cylinder Sunbeam is of the V type.

5—The Sunbeam and De Dion are the only ones making them at present.

6—The Moore multiple exhaust as used on the Lexington-Howard cars is not used by the Packard and others, but a system designed to give the same effect has been used.

7—The A. A. A. rule 69, which relates to the exhaust, states "the exhaust must be carried outside the hood and so directed as not to raise dust." It is evident from the above that the cars may be equipped with any type of exhaust system which does not raise dust, and the method usually adopted is that which permits of the gas getting away from the cylinder with the least back pressure. When the short pipe from the cylinder to the air is used and there is a strong wind blowing against the cylinders there is chance of increasing the back pressure.

WANTS TO CHANGE REO CLUTCH

1911 Type Can Be Made With Non-Burn Material Facing

Waumandee, Wis.—Editor Motor Age—Kindly describe, semi-floating, three-quarter floating and floating rear axles, and give advantages and disadvantages of each type.

2—Could a clutch in a 1911 Reo be equipped with asbestos-lined plates the same as in the present Reo cars?

3—Could the original plates be lined to avoid the necessity of getting new plates? My idea is that by doing this about half of the plates now used would not be needed.

4—What should the stroke of the oil pump be, on the same car, to give proper lubrication?—A Reader.

1—These axle types were described and illustrated in Motor Age, issue of March 26, page 25.

2—Yes.

3—This could be done, but the old plates would have to be drilled to take the rivets for the facing.

4—Some Reo motors will require more oil than others and the length of the pump stroke will be between $\frac{1}{2}$ and $\frac{3}{4}$ inch, depending on conditions.

HOW THE WAGONS DAMAGE ROADS

Texas Reader Outlines Causes of Wear of Our Highways

San Antonio, Tex.—There are two things which really tear up the roads—one is the horse, the other the wagon. If I were to lay carefully the plans to completely destroy the finest road that money could build I would do it in this way:

If the road were finished I would go in search of one of the big heavy wood-wagons with very narrow tires, in fact, the tires are almost pointed on some of them. I would fill the wagon to its capacity and

after the first rain I would drive the wagon over the road. I am sure you would find a rut 1 inch or 1½ inches deep, which would naturally fill up with water. Several hours later, after the water has had an opportunity to sink into the ground, I would drive right back over the same road. Now, the narrow tires are cutting down through the surface of the road, and the sharp calks on the horses' shoes are pulling up the surface. By turning out of the rut in order to avoid the heavy pulling the wagon slips back into the rut again and by so doing works the edges of the ground around the rut, which causes it to become wider and wider.

Now, this is only a start of what happens every time it rains. During the dry weather a wagon weighing 2 tons, 1,000 pounds to the wheel, with a 1-inch tire which is round, cuts into the surface and cracks up the hard crust which makes the topping. The next wagon breaks the crust up and in a very short time by narrow-tired wagons the hole is cut larger and larger. When the rain comes and the water stands in it, every time the wheel drops in, more mud is thrown out of the rut and more water drops in as it becomes deeper and deeper. The sharp tires cut into the ruts and the hole becomes larger.

Take, on the other hand, a macadamized road with a big six-inch tire wagon driven over the road, and the road is slightly uneven, the big tires roll along and press the rocks down into the ground and smooth the road out and help to keep it smooth. The foundation of the road is never molested because the surface is practically watertight, and as long as the surface is not cut through the foundation of the road remains firm. The horses not having calks on their shoes, their feet have a tendency to pound the road and pack it down, rather than tear it up. The horse, having a firm foundation, travels much faster and the wagon, not sinking in, pulls much better. The tires being large they do not stretch, which eliminates the necessity of having them reset. I should like to see a concentrated action against the narrow-tire wagons. This would cut the yearly appropriations for repairs on the roads at least one-half, which would be a saving on the roads for southwest Texas alone of over \$1,000,000. Just think of one wood-wagon coming 25 miles with a \$5 load of wood and doing more damage to the road than the amount the horse, wagon and wood is worth.—H. G. Hayes.

MOTOR HEATS AND KNOCKS

Spark Is Retarded Too Far—To Convert Ford to Cyclecar

Baltimore, Md.—Editor Motor Age—I have a 1913 Metz 22 which when run at high speed will overheat and pound. If slowed for a minute it will go as if it were never hot. The cooling system is clean, the motor is clean of carbon and the carburetor is in first class condition. Does Motor Age think it is the lubrication, the difficulty of the gases escaping at high speed or the set spark? Would it be any advantage to get a movable breaker box? The motor acts the same with the cutout open. The pistons are a trifle undersize.

2—I am going to cut a Ford model to cyclecar lines, 36-inch tread, etc. Does Motor Age think 800 pounds too heavy for belt drive? —P. T. Hill.

1—It seems from your description of the trouble with the Metz 22, that the difficulty is due to the fact that the spark is retarded too much. This would cause both the knocking and the overheating at high speeds. It is suggested that you try retiming the ignition, setting it slightly ahead of its present position, that is, so that the spark will occur slightly earlier at the stroke than at the present time. The knocking due to the retarded spark probably is exaggerated by the loose pistons.

2—Eight hundred pounds will not be too heavy for belt drive. If you succeed in satisfactorily remodeling your Ford into a cyclecar of 36 inch tread, we would be very glad to learn the details.

CAR JERKS; MOTOR FIRES WELL

Due to Play Between Rear Axle and the Motor—Examine Clutch

Corpus Christi, Tex.—Editor Motor Age—I have a 1912 second-hand Buick roadster which has a jerk which local mechanics have failed to locate or remedy. I have recently ground the valves; have put new platinum points in the magneto and the motor is firing perfectly, but there is a jerk, usually regular which resembles the actions of a car when one cylinder is completely misfiring. The rear axle is slightly sprung and this might cause some of the jerking, but many times I can throttle the car down with cut-out open and it will run along smoothly for a block or so and then will start to jerking. There is some play in the universal joint and differential, but no play in the rear wheels themselves. The peculiar part of it is that when the car is jerking, the motor is firing perfectly.—H. G. Sherman.

Excess play in the universals would be enough to cause the jerking, but assuming that this is not the cause you may look to the clutch, which may be gripping only at intervals. Do not throttle the motor down too low and expect it to pull smoothly. The usual cause of such action is play somewhere between the rear axle and the motor and if you will remove this play the jerking no doubt will vanish. It would be wise to take the car to the nearest Buick agent and have him look it over.

SPEED CHANGES OF ELECTRIC CARS

Operate Like Street Car—Benz Traveled 141.73 Miles Per Hour

Fowler, Calif.—Editor Motor Age—Do not the Stearns, Columbia, Palmer-Singer and Moline cars use rotary valve motors?

2—Is the model R Schebler carburetor much improved over the model L?

3—Has a three-point suspension motor any advantages over any other?

4—Has the automobile made the fastest speed made by any vehicle? What is the fastest mile ever traveled, and by whom?

5—Has an electric car any gears or only one speed?

6—Kindly describe the motor and gears of the 300 horsepower Christie, driven by Barney Oldfield, also the name and address of the maker.

7—Kindly describe the Mercedes, driven by De Palma at Santa Monica. Was it a poppet valve motor?

8—Is the facing used on the clutch of the 1912 Overland made of leather?

9—Could the 1912 Overland, which has a Kenwood oiler, be changed to have a splash system of lubrication without excessive cost? —L. E. Wells.

1—None of the cars you mention use rotary-valve motors. The Stearns, Co-

lumbia and Moline have the Knight sleeve valves. The Palmer-Singer has no rotary valve. The Speedwell is the only car using a rotary valve engine.

2—The model R Schebler is quite improved over the model L for certain purposes.

3—Adherents of three-point suspension for the motor believe that hanging the engine on three points prevent strains in the engine base and crankshaft due to twists which occur in the frame due to uneven roads.

4—The fastest mile ever traveled, of which there is an official record, is Bob Burman's mile in the Blitzen Benz, made at Daytona, Fla., April 24, 1911, at a speed of 141.73 miles per hour. Duray, in the 300-horsepower Fiat, traveled a kilometer at the speed of 142.9 miles per hour at Ostend, December 16, 1913, but the official record was not procured for the European regulations called for the distance being covered in both directions. This is the fastest speed ever made in a motor-propelled vehicle.

5—Electric cars in general do not have a speed change similar to that in the gasoline car. They have a number of speed changes, from three to seven, which are obtained by varying the connections between the battery and the motor and inserting resistances in the motor winding, in exactly the same way as it is accomplished in the electric street car.

6-7—These cars will be described in the special story on old racing cars, which will appear in an early issue.

8—Yes.

9—It is not believed that the advantages of the change would pay for the cost.

Maker of Sears Motor

Lake, Miss.—Editor Motor Age—Kindly give a complete diagram of the wiring of a Ford car necessary for installing master vibrator, electric lights, etc.?

2—Where was the engine made that was used in the Sears motor cars?—W. W. Graves.

1—Master vibrator installation was illustrated and explained in Motor Age, issue of Jan. 22, page 82. What electric lighting system do you want to install, one operated from the magneto or one of the special sets offered to Ford owners? The etc. evidently refers to starting systems and combined lighting and ignition systems. Make your question more specific so that a definite answer can be given.

2—Summer Motor Co., Bucyrus, O.

Questions Answered and Communications Received

A Reader.....Lovilia, Ia.
E. A. Porter.....Hubbard, Ore.
J. B. McQueeny.....Chicago
A Reader.....Waumandee, Wis.
H. G. Hayes.....San Antonio, Tex.
P. T. Hill.....Baltimore, Md.
H. G. Sherman.....Corpus Christi, Tex.
L. E. Wells.....Fowler, Cal.
W. W. Graves.....Lake, Miss.
No communication not signed with the reader's full name and address will be answered.



Cyclecar Development

Answers to Inquiries—Cyclecar Treads and Low Weight

KALAMAZOO, Mich.—Editor Motor Age—In your Motor Age story, March 12th, you state, "The nearer in line the wheels of the car are placed, the less side action there is when a bump is hit with one front wheel, and the less tendency to spin the car." In other words, more of the motor power is expended in propelling the car forward and less in side thrust. This is true in all treads up to 56 inches, standard, the wider the tread the more power is needed to drive the car.

I question the practical truth of your final deduction; considered, as you will understand, entirely apart from the question of wind resistance. I think I can see why you believe what you do, but I believe you are confusing force with work and mistaking an example of the exertion of a force which acts through zero space for a force acting through a definite space and hence, giving rise to work done at the definite rate, hence, the exertion of power which is the time rate of doing work, $F \times S$

$$W = \frac{F \times S}{T}$$

To start the discussion I have selected for illustration Fig. 1 what might be considered an iron block sliding in a groove, propelled by a force acting parallel to the groove and concentrated at the center of gravity C. Suppose a resistance to be interposed at the point B and acting along the line B-D. The problem is, to ascertain the propelling force F_t which would be required in order to force the block to continue at its original velocity. It is evident that the force F_1 applied along the line B-D would cause a twisting moment equal to

$$F_1 \times CD = F_2 \times L$$

The side force F_2 causes frictional resistance equal to

$$2F_2 f = 2F_1 CD = F_1 \times L$$

where $F =$ coefficient of friction.

In other words it causes a frictional resistance which is proportional to C-D or proportional to the tread, thus the total force required for propulsion equals

$$F_1 \text{ plus } F_2$$

and F_1 is proportional to the width of the block.

From your writings I have gathered that you believe that the force required to push the machine is increased proportional to the tread. Is not the error of this theory now clear to you and is it not the fact that the resistance F_1 simply increases the demand for propulsive force to the extent of $F_1 \times$ the frictional resistance represented in my diagram by F_1 , which is proportional to some kind of coefficient of friction and to the tread. The extent to which tread is a factor in road resistance therefore depends upon whether or not the f of this demonstration considered in the case of motor vehicle is or is not a negligible quantity.

To summarize, this demonstration, I believe, proves that the extent to which the tread influences propulsive power required depends upon the value of coefficient of friction involved in resisting the tendency of the car to rotate horizontally about its center of gravity. And this coefficient of friction is a difficult thing to evaluate, with any data available. I believe that it is too small to be important and that this may be demonstrated satisfactorily by considering the same block of iron which we were above subjecting to such rude treatment as mounted on 4 rubber tired wheels and being pushed along a smooth iron surface. Interposed in the path of one of the front wheels is the bump which gives rise to this discussion. Suppose the block to be propelled equally by the two rear wheels. When one front wheel strikes the bump the block tends to swivel but it is prevented, in this case, by a refusal of the tires to slip side ways. The elasticity of tires allow them to yield a little and if the shock is sufficiently severe they

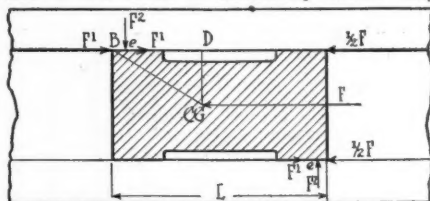


Fig. 1—Iron block sliding in groove to illustrate principle

might even slip a very little bit but I cannot conceive of a coefficient of friction thereby introduced as being great enough to affect propulsive power required to a degree worth practical consideration.

At any rate, it would seem that you must grant that power required to overcome road resistance is not proportional to tread and is not influenced by the tread in the way in which you have claimed, and that at the very worst, tread affects propulsive efficiency only to the extent governed by a coefficient of friction, the value of which is very uncertain.

And this is not all. I find that I must attack your theory regarding the influence of a high center of gravity upon the propulsive power required to surmount obstacles. The gravity center of the Cornellian is very low and, therefore, it is evident I have no bones to pick in making this contention.

For discussion I have reproduced the diagram in your Motor Age story, March 12, with such additions as are necessary for my demonstration. I contend that your statement that the line B-C, "resolved to its elements shows B-D as the forward thrust line and C-D the proportionate amount of power needed to overcome the bump," is erroneous.

Suppose the machine to be proceeding along on a smooth, level road, the effective propulsive force F_t is opposed by the equal and opposite sum of wind resistance, R_w plus rolling resistance, R_r or

$$F_t = R_w \text{ plus } R_r$$

The resultant line of force at the front wheels, which is perpendicular to the ground when the machine is at rest, is inclined when in motion at an angle whose tangent is road resistance divided by weight on wheel. And the same is true, of course, for the rear wheels, but the equation representing the power consumption would be

$$(R_w + R_r) \times \text{feet per minute divided by } 33,000 = H. P.$$

You will observe that the height of the center of gravity in this case has nothing to do with the power consumption.

Now introduce the bump B. You simply are increasing angle of inclination of the road resistance force at the front wheel, thereby giving it a larger horizontal component and the equation still remains as above, irrespective of the height of the center of gravity.

Please do not think that I am contending for a high center of gravity. With it a car has less stability, poor riding qualities and more wind resistance. But I believe it is unwise to confuse these disadvantages with road resistance, which is independent of the height of gravity center.—Howard E. Blood, vice-president Blood Bros. Machine Co.

There have been several comments received on the statements made by the

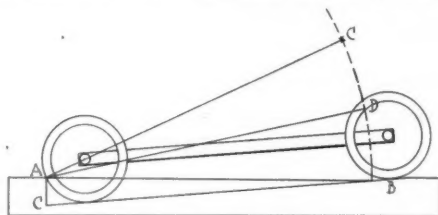


Fig. 3—If center of weight is on A-C car will stop

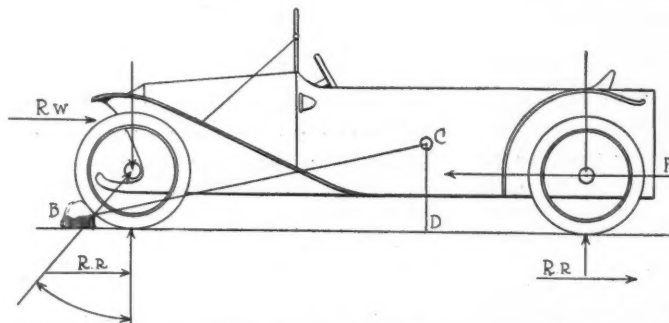


Fig. 2—Illustrating momentum required to overcome obstructions

writer in recent issues relative to the lower power requirement of narrow tread and of low weight. The gentlemen finding fault with the argument evidently have misunderstood my premise. They have argued from a static condition—one of direct thrust by the power plant—while I have had in mind the resistance of the road to a moving object, an object with momentum, this momentum, when a bad obstruction is met, taking its center of effort from the center of gravity of the mass, and the line of thrust acting from this point to the point of contact with the obstruction. Mechanisms interposed, such as the wheels and springs, may transfer this shock in a roundabout way, but the action is through this line.

Suppose the car in the drawing in Fig 3 to be traveling downhill, coasting under the power of gravity. An obstruction A is met. If the center of weight of the car is on the line A-C running through the center of the front wheel, then the bump will bring the car to an absolute stop. If it is on a line A-D running below the center of the front wheels, then there will be momentum effort tending to lift the wheel over the obstruction, and the lower down the more it will tend to mount the bump and the less stored-up energy of momentum will be used up in moving the car forward. In other words the lower the center of weight the less momentum of motion will be used in mounting road obstructions. In this hypothesis the wheel size has a relation to the power output only in its center's relation to the center of gravity.

Now take the static case with the same car and same road obstruction. Suppose the car standing still with the front wheels against the curb, as shown. When the power is turned on, acting from the rear wheel's point of contact with the ground, the thrust line will be A-B running from this point to the point where the front wheels touch. The power of the motor on this line will tend to lift the car over the bump, the line C-A being the lifting component. This, however, is not the idea of the argument, which is the consumption of power at speed on the road. In this momentum is power in the form of stored up energy, and on striking an obstruction the line of shock when the power is on will

vary between the center of gravity and the line A-B, in proportion to the degree of shock. If the bump is more resistant than the thrust of the rear wheels, the thrust line will mount until the thrust of the motor on the rear wheels is almost negligible compared to the power absorption by the bump. It will then take the motor an appreciable period of time to restore the mass to the original speed and momentum, this consuming power. The speed of the car depends on this time taken to keep the momentum figure to a maximum after road roughness has detracted from the mass movement. Proof of this momentum idea is shown in a high car being able to put the front wheels against a curb and drive over, whereas the same car driven at speed against the curb would be thrown back.

This same theory can be followed to show the lower power absorption of narrow tread, the side effort of overcoming a bump consuming less momentum effort of the car than when the bump on one wheel has a greater leverage. The exception to the rule is standard tread, for here road conditions offer less obstruction to the wheels and hence do not present the side thrust problem that is present in near-standard tread cars. With narrow tread no more side effort is felt on rough roads than is felt by standard tread cars on good going. If a car is not standard in tread it had best be narrow.

CYCLECAR IN DEVELOPMENT STAGE **Progressing Rapidly—No Three-Cylinder** **Motors at Present**

Leipzig, Germany.—Editor Motor Age—Kindly tell me whether there is in America a small narrow-tread car with a very low gravity point, yet the lowest part not less than 10 inches above the ground, great lightness, perfect springing and if possible efficient protection in rainy weather, seating two persons and baggage about 400 pounds in all, or whether you know of any such car in Europe, and what would be the cost?

2—Would a larger motor and a slightly stronger frame be more advisable for very bad roads than a standard cyclecar?

3—Is there any three-cylinder cyclecar motor marketed?

4—If no cyclecar of the above description is available, where could a motor and all parts be obtained? Kindly give the name of a concern which will build such a car to order?—H. Potulicki.

1—Motor Age knows of no car at present available, either here or abroad, of the type mentioned, although there will be several on the market, in all probability, within another 12 months.

2—America is developing the cyclecar at a very rapid rate, but has not as yet reached the point where it would be safe for one so far away to absolutely depend on the construction, as a breakdown at that distance might mean a delay of several months before you could again have your car on the road. For poor roads, the type of car mentioned would, in all probability, be the best type. It is possible that you would need a 12-horsepower motor even with the narrow tread, if you have to go in very much mud.

3—We have no record of any three-cylinder cyclecar motors at present.

4—We know of no place where a de-

pendable cyclecar can be bought in knock-down shape. A car built to order would probably be more expensive to repair on account of the non-standard parts than one purchased from a factory with duplicate parts.—H. Potulicki.

LIGHT PISTONS LESSEN VIBRATION

States V-motors Do Not Run Smoothly **When Idling**

Little Rock, Ark.—Editor Motor Age—In the articles in Motor Age on the cyclecar there have been told many interesting things, but nothing has been said about the much-discussed poor balance of the V twin. My experience with a motorcycle was that the vibration, while quite noticeable on the stand, was not felt when on the road. Has any manufacturer in this country, or have you, tried the rubber belts which are so well spoken of by the English users?

2—What are their advantages and disadvantages?—W. B. Kennedy.

Where the motor is set crosswise in the car frame and well hung, with not too high a gear there is little or no trouble with vibration from V motors with light pistons. The vibration of some makes has been due to heavy pistons and connecting rods, but this has been obviated in recent models. A V twin motor has been used on a 3½ to 1 gear ratio and no noticeable vibration has been felt when racing idle. On the road the shake, as you say, is not felt.

1—Rubber belts have been used on cyclecars and give better traction, but are much shorter lived. They do not hold so well when wet as a leather belt. For ordinary weather they are much cleaner and handier, but it is customary to carry a spare leather belt for rainy weather in motorcycle work abroad. The same might be true of the cyclecar.

NARROW TREAD IN HEAVY SAND **36-inch Gauge Handier Than 56 on Southern Roads**

Demopolis, Ala.—Editor Motor Age—Will cyclecars negotiate bad sandbeds? In many sections of this country we are unable to use even the 56-inch tread owing to the fact that it will not fit the 60-inch sand ruts. How about narrow-tread cyclecars?—J. R. H.

This is why the cyclecar is narrow tread. If near to standard tread there is a tendency to spread the wheels through their being almost in the rut, but not quite. This uses up enormous power. If the tread is narrow enough to miss one rut there is no side pull and more power is left to drive forward.

The writer has driven through very deep lake sand and had no trouble in passing big cars in this going. If the speed is kept up the cyclecar will go over the top of sand with little trouble. If it stops there is need for plenty of power to start again. Use large tires and leave them soft when going over sand and you should have no trouble.

PLEAS FOR TWO-CYLINDER MOTOR **Says Type Is Suited for Cyclecar Use—** **Gives Some Examples**

Seattle, Wash.—Editor Motor Age—After reading the cyclecar articles by Mr. Stout, and especially his last three writings, I wish to enter a plea for the

two-cylinder opposed, water-cooled motors for cyclecars.

What is the main objection to the two-cylinder opposed motor? It is, there have been so many cheaply constructed motors of this type, built in this country and used in motor cars, that many persons believe all motors of that pattern to be inefficient and troublesome. Never was a more fallacious generalization made; such belief is not founded on fact. What vehicle ever had a better engine than the Autocar runabout with its two-cylinders, 4 by 4 inches, opposed? The same style of motor, but of slightly increased size, has been in use for years on one of the most efficient trucks made in this country, the output of the Autocar company.

The Autocar runabout weighed about 2,000 pounds, and its motor had 100.53 inches displacement. A cyclecar motor on the same lines, with cylinders 3½ by 3½ inches, would have about 63 inches displacement, and for a cyclecar weighing less than 700 pounds would give ample power and flexibility. The shorter stroke is suggested to keep the motor as compact as possible, so that the cylinder heads would not protrude far beyond the frame of the narrow cyclecars when placed transversely, as for friction drive. The writer has had experience with such a motor, followed by a two years' use of a 4-cylinder engine of 3¾ bore and 3¾-inch stroke, and does not hesitate to say that the two-cylinder motor was of infinitely less trouble and about one-fourth the expense of the four-cylinder engine.

The cyclecar makers might as well admit what Mr. Stout has accurately observed,—that we have not, as yet, a suitable cyclecar motor. To say nothing of odor in warm weather, the two-cylinder V's are too hard to start, and have not the required flexibility—do not distribute the power with anything like the equableness of the two-cylinder opposed.

If these conclusions are not accurate on engineering principles, of which the writer claims no knowledge, wherein lies the argument for their inaccuracy?—S. R. Parker.

Planetary Gearset for Cyclecars

Vinton, Ia.—Editor Motor Age—Is the planetary transmission successful on a heavy cyclecar and how does it operate?

2—What stroke motors do racers use, long or short?

3—Which is more powerful and which the speediest, a very long stroke motor or one of medium stroke?

4—What companies manufacture a four-cylinder air-cooled motor?—F. Towner.

1—Yes. Planetary operation was explained in Motor Age of April 2, page 35.

2—Foreign cars are mostly long stroke, American are medium long.

3—The long stroke is the more powerful if figured from the basis of fuel used, otherwise the power depends entirely on construction and the complete design. The long stroke generally allows a higher piston speed, but balancing is the great problem.

4—Henderson Motorcycle Co., Detroit; Davis Mfg. Co., Milwaukee.

How Makers Prevent Oil from Leaking Upon Brakes

Representative Rear Axle Construction Explained—Felt Washer Standby of Many

PREVENTING the grease or oil in the differential housing from making its way to the brake bands and thus causing inefficient braking was a big problem to manufacturers some years ago, but the difficulty has been overcome largely in all the present types. In all the axle housings on the market some precaution is taken to prevent this leaking and in nine cases out of ten when a leak occurs despite this the condition is caused by placing too much oil or grease in the housing.

Inner and Outer Ends Protected

Felt washers have been found to be a very effective dam and these are placed either singly or in units of twos and threes at the outer or inner ends of the housing. In some instances felt washers are used at the inner ends near the differential and in others the outer end is provided with the shield. In other instances washers are used in connection with an arrangement for throwing the oil or grease to one side, diverting its course either toward the ground or to some sort of a receptacle.

In the Timken construction, which is shown in Fig. 3, an internal sleeve is used around each shaft. This sleeve is hollow and surrounds the axle shaft and when a car rounds a curve and the oil is thrown to one side the sleeve acts as a pocket and retains the oil. The oil is held in this pocket and when a straight course is taken it gradually falls back into the differential housing. It is clear that too much oil in

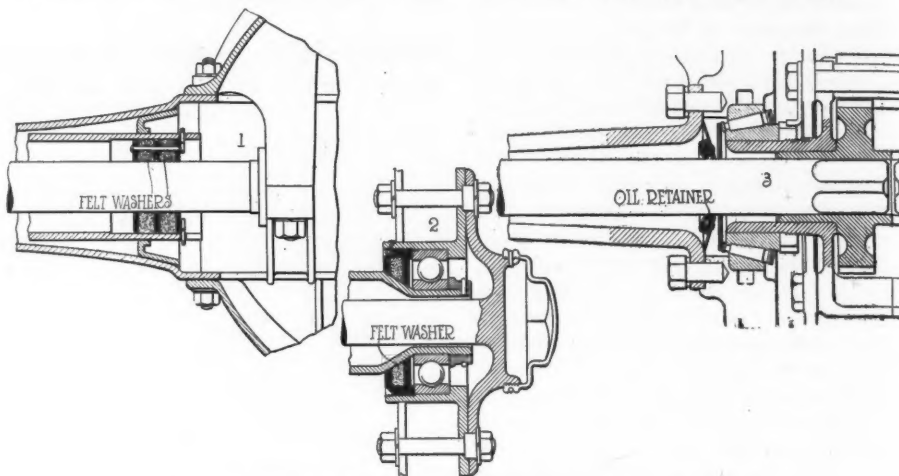


FIG. 1—THREE METHODS OF PREVENTING OIL LEAKAGE

1—Showing the double felt washer construction used on National cars; 2—Hess axles have a bent axle tube and a felt washer, making the path of the oil upward in the tube, and only when under abnormal pressure will it work out through the bearing to the washer; 3—Winton axles use the oil retainer construction shown

the housing will cause a pool to form in the sleeve continually.

The Weston-Mott company in its axles employs a number of different methods, utilizing both felt washers and what is called an oil slinger. If reference is made to Fig. 2 the Weston-Mott construction will be clear. No. 3 in the illustration shows the early type which used a malleable iron ring with grooves, to form a guard by means of capillary attraction. The guard is backed by a felt washer, so that if any

oil happens to make its way through the ring the felt prevents it from going to the brake bands. As a further precaution a hole is drilled under the spring seat to allow any oil which may make its way past the ring and felt to drip out. At the same time it lubricates the spring seat.

In the latest type of Weston-Mott axle, shown at 1 in Fig. 2, three felt washers are used at the inner ends of the shafts and an oil slinger is attached to the brake drum. The slinger catches all oil which makes its way past the felt washers and allows it to drip into a basin and then to the ground through a small pipe, shown in the detail in the lower right corner of the illustration. This form of construction will be used on all 1915 Mott axles. In the three-quarter floating Mott, shown at 4, and the floating shown at 2, the arrangement is the same. These are provided with oil slingers attached to the dust guards on the hubs, which allow all oil which works through the bearings to flow to a basin on the brake flanges and then drip to the ground.

Special Method on Winton

In the axle used on the Winton six a special type of oil retainer is used which is placed at the outer end of each axle shaft, as shown at 3 in Fig. 1. It is stated that only when this retainer becomes worn or the housing is filled with too much lubricant will the oil work its way to the brake bands and should this occur the replacement of the retainer is simple.

In the Hess three-quarter floating axle, made by the Hess Spring and Axle company, a very ingenious arrangement is used. It will be seen by referring to 2 in Fig. 1 that the axle housing is shaped peculiarly at its end. Should any oil get as far as this bend the oil may work be-

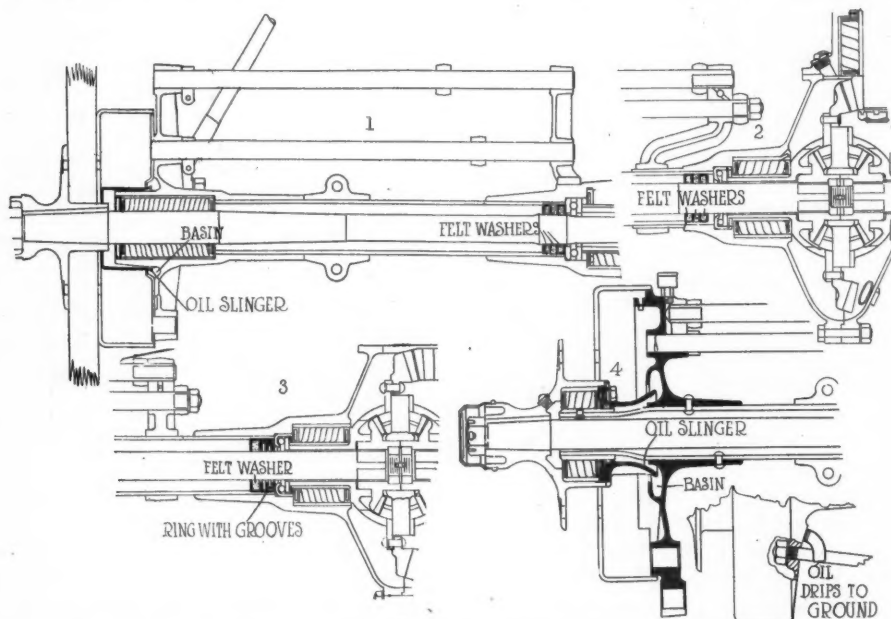


FIG. 2—METHODS USED IN MOTT AXLES FOR PROTECTING BRAKE BANDS

1—The latest type used by the Mott company, which consists of three felt washers at the inner ends of the shafts and an oil slinger attached to the brake drum. The slinger diverts the course of the oil toward the basin; 2—Another type which uses three felt washers and an oil slinger, the former at the inner end and the latter at the outer; 3—An early type of Weston-Mott axle, which used a malleable ring with grooves to form a guard by means of capillary attraction. The guard is backed by a felt washer as shown; 4—The three-quarter floating axle showing the oil slinger, which causes the oil to drop to a basin and then to the ground by means of a small pipe shown in the detail

tween the axle and housing and then around and through the bearing. But after that its path is interrupted by the felt washer shown. The replacement of this washer requires no extraordinary skill and not very much time.

The National car has a double felt washer arrangement at the inner end of each shaft, as shown at 1 in the same illustration. These washers are held securely in place and catch all oil which is thrown to one side when the car rounds a curve. No trouble has been experienced with this construction and in every instance where leakage upon the brake bands has been reported it was due to too much oil in the housing.

The arrangement in axles made by the American Ball Bearing Co. is shown in Fig. 4 at 1. This axle employs graphite packing backed by a spring, as shown, and all oil leaking past the inner bearings and packing is caught in what is called a retaining tube. This construction has been very effective, it is claimed, and in a letter the American company states that only in cases where too much oil has been used have the brake bands been affected. At the outer end of the axle shafts the American company provides oil retaining rings and a felt washer, which may be replaced easily.

A system of packing as shown at 3 in Fig. 4 is used by the Peerless Motor Car Co. in its construction. Here, hard felt is held against the axle shaft by means of spring and wedge action. The spring takes care of the wear in the system and on the whole the Peerless company states a positive leakproof construction is used.

The Salisbury Wheel & Mfg. Co. employs a combination of a grease retainer and felt washer, as shown at 5 in Fig. 4. The container is part of the casting on the hub brake support and whatever oil or grease may work itself through from the bearing will be thrown into this container and thus prevented from getting upon the brake bands. The felt washer is an added feature, but as it revolves on the stationary hub of the brake support there is some chance of grease working through. The replacement of this washer when it becomes worn is necessary.

At the outer end of the axle shaft on the Chalmers car is a felt washer, as shown in Fig. 4 at 4, which is used to prevent oil leaks. The path of the lubricant, should too much be used, is through the housing to the outer end, then through the bearing to the washer. The Chalmers company reports little trouble through oil leakages.

In the majority of axle constructions on the market the felt washer seems to be the ideal form of barricade for the oil, and when these washers become worn it remains to have them replaced to prevent leakage upon the brake bands. In the Studebaker these washers are placed at

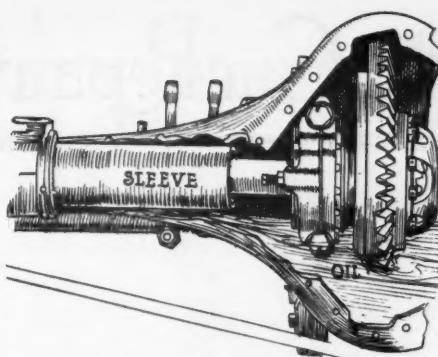


FIG. 3. TIMKEN AXLE CONSTRUCTION

A sleeve is placed around each axle shaft, and when oil is thrown to one side the sleeve acts as a pocket and retains the oil

the outer ends of the axle shafts and are helped by an additional leather washer. Follow the car maker's instructions regarding the quantity of oil to use and no trouble will be encountered.

WAR HELPS GUAYULE INDUSTRY

Alpine, Tex., May 4—The protracted warfare in northern Mexico has had the effect of giving the wild guayule shrubs upon the ranches an opportunity to grow

undisturbed, thus replenishing the supply of material for manufacturing crude rubber. Practically all of the guayule rubber factories in the Torreon district where the industry was chiefly carried on have been closed down for much of the time during the last three years. Even the factories that kept running drew their supply of raw material from stocks already on hand. Now that the wild guayule shrub has been permitted to grow upon vast stretches of ranch land without interference, much of the area that was nearly exhausted of the valuable product 3 years ago is able to afford another big supply for the factories.

Most of the guayule shrubbery that a few years ago covered a considerable scope of territory in this upper border region of Texas has been exhausted by the rubber factory at Marathon, Tex. Recently representatives of a rubber factory in Mexico made an investigation of the guayule shrub growing territory in the state of Coahuila, bordering on the Rio Grande south of here. They found that millions of acres of land are covered with the valuable product. Contracts have been made for the purchase of quantities and a factory will be erected at Boquillas, Tex.

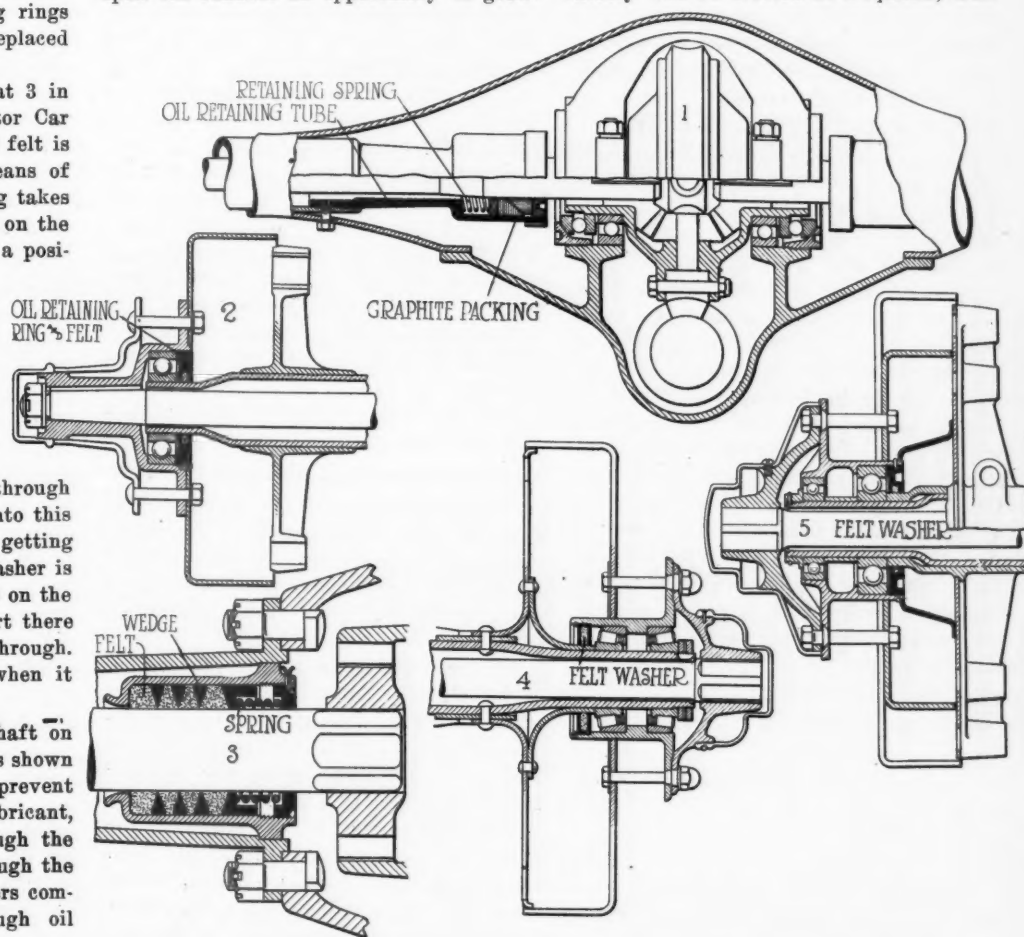


FIG. 4—EFFECTIVE METHODS FOR PROTECTING BRAKE BANDS FROM OIL

1 and 2—American rear axles are constructed with graphite packing backed by a spring at the inner end and a retaining ring and felt washer at the outer end as shown; 3—Peerless cars are equipped with a system of hard felt, held against the axle shaft by means of a spring and wedges; 4—A felt washer behind the bearing at the outer end is used in Chalmers rear axles; 5—The Salisbury axle has a combination of a grease retainer and felt washer. The container is part of the hub brake support casting and all oil working through is thrown into this container



The Motor Car Repair Shop



AT present there are five successful methods employed for removing carbon from the cylinders of motor car engines, these being by kerosene, denatured alcohol, proprietary compounds, oxygen, by the use of special scraping tools.

The use of kerosene does not show the results that denatured alcohol or oxygen show, and scraping with the cylinders off the crankcase is perhaps the most effective method in use. In the kerosene treatment the coal oil is poured into each cylinder at night while the cylinders are hot and permitted to remain there until morning. It is a loosening process and the freed carbon is supposed to blow out with the exhaust the next morning when the motor is started. About $\frac{1}{2}$ tumblerful of kerosene is poured into each cylinder through a spark plug opening or through a pet-cock. In the morning the motor is started and raced occasionally until no more black smoke appears at the exhaust. Some motorists feed a little kerosene through the auxiliary air intake of the carbureter while the motor is running.

Alcohol Method

The use of denatured alcohol is simple. It is best used when the engine is hot, as immediately after a run. If the carbon deposit is slight it usually is not difficult to be removed, but if the deposit is a heavy one it may be necessary to remove the spark plugs of the cylinders to be operated on and fill the combustion chambers with alcohol, leaving it to soak over night. It is obvious that only two cylinders of a four-cylinder engine can be treated at the same time, for the simple reason that while two of the pistons are at the top of the stroke the other two will be at the bottom. The alcohol can be removed with a gun. When the engine is started up the carbon, if sufficiently loosened, will be thrown out. Of course, the treatment will vary in proportion to the thickness and hardness of the deposit.

The Oxygen Treatment

It is known that carbon will burn in the presence of oxygen and the oxygen method takes advantage of this and causes the gas to be injected into the cylinder over a flame obtained from a match or wax paper.

It is suggested that the day before operations are to begin the engine be given the conventional kerosene treatment as outlined above.

As a precaution against fire the gasoline is shut off from the carbureter and the motor started so that the fuel in the line will be consumed. Work is done on one cylinder at a time. Taking the first cylinder, either a spark plug or a cylinder plug is removed. The motor is then turned

Methods of Removing Carbon

over until the piston of that cylinder is on top dead center.

The outfits on the present market are fitted with gauges and this gauge should be made to register about 12 pounds. The hose attached to the tank has at its end an injector tube. This tube is directed into the cylinder through the opening. The injector is controlled by a valve, in one case a trigger valve, so as to be manipulated easily. The valve is opened and oxygen permitted to circulate in the cylinder. A lighted match is dropped into the cylinder and the injector tube moved around as much as possible so as to cover a large area. The combustion of the carbon is accompanied by sparks and perhaps a little flame from any oil with which it may be soaked. Once the carbon begins to burn the action continues without interruption as long as oxygen is being supplied. The difficulty with many has been in getting the initial burning. The use of burning matches as before mentioned is good, but many state that the wax taper is better, insuring immediate burning. When the sparks cease flying the operation is finished. It is advisable after cleaning carbon to grind the valves, but this should not be done if the motor compression is good. A little oil should be poured into each cylinder and the motor turned over a few times after the operation is over, because the flame leaves the cylinder and piston dry.

The hand scraping method will be taken up next week in this department.

Oxygen Process Damages Spark Plugs

"Look before you leap" is the advice that the New York branch of the Bosch Magneto Co. is moved by its experiences, to offer those who make use of oxygen to remove carbon from the combustion chamber.

It seems that while the oxygen method is ideal to accomplish the purpose, especially in that it does not require the dismantling of the engine, yet there has been found a real need to set up the "Safety First" signal, so to speak.

The usual method of administering the treatment is simply to insert the tube from the oxygen tank into the cylinder, whereupon the contact of the oxygen and carbon makes the latter combustible, so that applying a lighted match at the opening ignites the carbon and it burns away to a mere nothing. So far, we are led to believe, all is well and the treatment has been successful, but the terrific heat generated in the cylinder has unfailingly had a disastrous effect upon the accessories with which it came into contact.

The spark plugs are among the principal sufferers from the oxygen treatment. Quite frequently this method of carbon removal is made use of in engines having two spark plugs to each cylinder and the oxygen tube is passed through one of the plug orifices and the remaining plug, not being removed, is consequently subjected, during the burning of the carbon, to terrific and constant heat such as was not taken into consideration by the maker of the plug. In consequence, various detrimental results are liable to follow; the porcelain or other insulating material may be damaged and the plug thus made worthless, or the points or electrodes may become warped, burned and otherwise distorted from their proper relation to one another.

There is nothing in the foregoing to condemn the oxygen process for carbon removal—for that specific purpose it seems very satisfactory—but the express purpose of these paragraphs is to offer the suggestion that, with the use of this process, a generally satisfactory result can be assured only if the spark plugs regularly used are removed and replaced with blanks or a set of discarded plugs during the time that the intense heat is present in the cylinder.

An Interesting Bearing Test

The American Metal Co., Pittsburgh, has been conducting a number of tests to determine the efficiency of a bronze journal bearing, composed of 65 per cent copper, 30 per cent lead and 5 per cent tin, treated in crucibles. They are solid bronze castings requiring no babbitt surface.

In a test for the Baltimore & Ohio railroad a 22-pound bearing was placed under the tender of a locomotive. After the engine had run 51,000 miles an examination of the bearing was made, it being said that it had worn $\frac{1}{32}$ inch, without becoming heated at any time. Other bearings on the tender were re-babbitted six times each, according to the shop superintendent in charge of the locomotive.

Don't Neglect Grease Cups

A spring shackle bolt invariably is frozen when the grease cup provided at this point is neglected. In many repair shops it takes a man 20 minutes to remove one bolt and in one case in particular, the Stearns-Knight agency in Chicago, a special tool had to be designed to make removal of frozen bolts easy. It was found that the men spent too much time trying to remove them, all because the owner forgot to give the cup an occasional turn. The spring ends have grease cups, but there are many more about the car which require attention and when forgotten increases wear, and much trouble may result.

The Accessory Corner

Scott Curtains

A NEW idea in side curtains for the motor car appears in the equipment now being manufactured by the Star Storm Front Co., Troy, O., for touring cars and roadsters. These are known as the Scott curtains and are shown in Fig. 2.

This curtain equipment, works on the window shade fixture plan, the curtains rolling onto all-metal rollers which are fastened to the front upright bows on straight tops, to the windshield fixtures on roadsters and to the horizontal bows on one-man tops. The rollers themselves are contained in drawn-steel, channel shields which have special attaching fixtures, making it possible to remove the entire apparatus of curtains and rollers if desired. On straight tops the bottom part of the shield fits against an adjustable spring clip attached to the goose-neck top iron and straddling it so that one roller is on either side to allow one curtain to pull forward and the other to go to the rear. The top part of this double shield is engaged by an eccentric lever fastened on the inside of the bow about where this bow begins to curve into the top. Of course, in the case of roadsters a single roller is used which unwinds to the rear from the side of the windshield. With the one-man top the curtains must pull downward.

To strip the car of the curtain equipment the eccentric lever is first pushed up, after which the shield may be lifted from the lower fixture attached to the goose-neck. A leather case is provided for the rollers and shields, making it an easy matter to put the whole set away compactly within the storage compartment of the car if desired. It is said that it requires but $\frac{1}{2}$ minute either to remove or replace the entire equipment.

Since these Scott curtains operate upon the shade roller principle, it is possible to allow large celluloid windows in them, making clear vision easy from within. The curtains may be drawn either from within the car or from the outside. On releasing

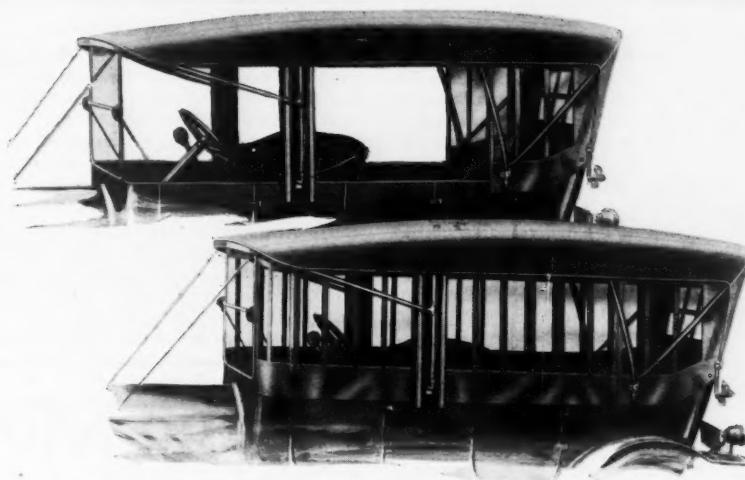


FIG. 2—A new type of side curtains called the Scott. The lower illustration shows them in place and the upper how they are rolled up

the catch the curtains automatically roll up within the shields without trouble, due to the heavy tension springs within the rollers.

Hawthurst Auxiliary Carbureter

A device which is tapped into the intake manifold of a motor and which feeds the auxiliary air as a water vapor is announced by the Halliwell Co., Los Angeles, Cal. This device is said to increase power, prevent carbon deposits and increase the mileage per gallon of fuel. The water for obtaining the vapor is fed to the glass mixing chamber shown in Fig. 1, and through it the auxiliary air is sucked. In passing through the water a certain amount is absorbed by the air and the spray of water vapor mixes with the fuel. The amount of vapor is controlled by the valve at the left, while the valve at the right controls the air. This device sells for \$15 with water tank and connections.

Delta Electric Handlamp

A very handy trouble lamp, which in emergencies may be used as a sidelight, is announced by the Delta Electric Co., Marion, Ind. This lamp consists of a steel case, within which is placed an ordinary

No. 6 dry cell, which may be bought at any supply house, and to this case is attached a lamp with reflector and bulb as shown in Fig. 1. A handle on the case permits of the lamp being carried around easily. The control is by means of a sliding switch, B, in the illustration, which is easily operated by the thumb. The bulb is of two-candlepower and is fitted in front of a glass reflector. A decided feature of this accessory is that the bulb will burn for more than 30 hours continuously, it is claimed. The Delta stands $8\frac{1}{2}$ inches high and sells for \$2 with dry cell.

Grus Spring Leaf Oiler

William Grus Jr. & Co. is marketing the spring leaf oiler shown in Fig. 3, which is designed to feed oil continually between the leaves of the spring. The device is clamped to the spring as shown and between the metal and the leaves is a leather washer, C. The oil is placed into the retainer R and from here it works its way to the washer which feeds the leaves, it is stated. The Grus sells for \$1.

Klear Vieu Windshield Compound

A liquid, known as Klear Vieu, which when placed on the windshield of a car prevents the shield from becoming obstructed by rain, has just been brought out by the Klear Vieu Co., New York. This substance sells for 25 cents per can.

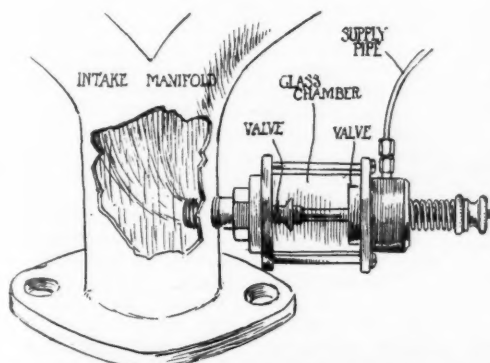


FIG. 1—The Hawthurst auxiliary carburetor is shown at the left and the Delta electric inspection lamp at the right

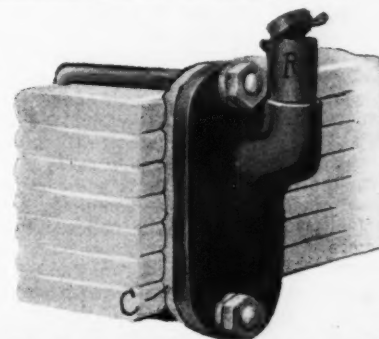


FIG. 3—Grus spring leaf oiler in position



From the Four Winds



STATE Buys Cyclecar—The Massachusetts department of weights and measures has just purchased a Trumbull cyclecar for the use of one of its inspectors in and about Boston and if it stands up well, others will be purchased.

Cooper Enter Tacoma Races—Earl Cooper has sent his entry to Secretary George D. Dunn of the Tacoma Carnival Association for the big races on July 3 and 4, and declares that he will endeavor to make as good a showing as he made last year when he won two out of three events.

Canada to Spend Fortune for Tires—Ten million dollars is what Canada will spend for tires during the year 1914, according to an estimate made by one of the largest tire companies on the continent. In 1913 the amount spent for tires in Canada was \$7,000,000, according to the same authority.

Cyclecars for the Holy Land—Philip Maalof of Beirut, Syria, is in America, looking over the truck and cyclecar field with a view to establishing agencies in Egypt, Beirut, Hallap and other parts of Syria. He has decided to pick out the Imp cyclecar, made at Auburn, Ind., and is now looking for a good 1-ton commercial vehicle before he returns home.

Buying Drags with Road Funds—As a result of the recent series of good roads rallies in Denver, Colo., and four surrounding counties, the county commissioners of Douglas county have ordered material for twenty-five split-log drags and are making arrangements to have them used systematically by residents along the main roads. State Highway Commissioner Ehrhart has announced that any county furnishing drags for farmers and others agreeing to use them on their roads will be allowed by the state highway commission to charge half the cost of the drags to the state road fund.

Seller of Broken Part Liable—It has been ruled in the United States court in Syracuse, N. Y., that the occupant of a motor car who is injured by the breaking of a certain part of the car can recover damages from the company which assembled and sold the machine, rather than from the manufacturer of the part that broke. On this ground \$8,000 damages were awarded E. W. Johnson of Amsterdam, N. Y., against a Detroit company. Mr. Johnson sued the company to recover damages for injuries received in 1909, when a wheel on his car broke and the car turned turtle. The company contended that if anyone was liable, except the plaintiff, it was the manufacturer of the wheel.

Split Over New Insurance Clause—The new family clause in motor car liability policies has caused quite a stir among the underwriters. Several months ago there was a decision by the appellate division of the New York supreme court holding that a wife driving her husband's car for her own pleasure is not the agent of her husband, and consequently she cannot be held legally liable for injury sustained through her negligence. This decision made a stir among the brokers because it had not been realized before that the commonly constructed motor car liability policy covered no more than the owner himself and his employee hired by him to run the car or some one bound on the business of the owner. Coverage of a wife or person who cannot be considered an agent of the owner has heretofore been subject to an added

premium of 15 per cent of the rate of the original policy. The new clause not only covers the wife, but the family and all others who may be legally driving the car and who are not paid servants.

Statistics on Ohio Roads—In a recent report made by Hugh K. Lindsay, chairman of the good roads committee of the Ohio State Automobile Association, the total road mileage of the Buckeye state of 81,299 miles is divided as follows: Brick roads, 500 miles; concrete roads, 66 miles; macadam roads, 11,403; gravel roads, 14,944 miles; earth roads, 54,242 miles, and miscellaneous type, 74 miles. He says that because of the

fact that the character of the 566 miles of brick and concrete, 11,403 miles of macadam and 14,944 miles of gravel roads is not the best, that the state is not as well provided with roads as might appear on the face of the report.

Virginia Licenses Total 8,373—The secretary of state has issued to date 8,373 motor car licenses for Virginia. These licenses brought to the road fund of the state \$72,614.90, and the amount will be greatly increased during the next few weeks.

Retail Gasoline Price Drops—The Gulf Refining Co., Houston, Tex., has cut the price of gasoline at retail stations to 10 cents per gallon, making the third reduction of 2 cents a gallon during April. Other marketers have followed with same reductions.

Imports Increase 92 Per Cent—According to Sir Owen Phillips of South Africa, the prosperity of that country can be gauged by the number of motor cars imported. Last year the value of such imports was \$5,391,243, against \$2,812,467 in 1912, an increase of 92 per cent within a single year.

Organize to Boost Good Roads—The Will County Good Roads Automobile Association was organized at Joliet, Ill., last week by the election of the following officers: President, A. H. McGinnis; vice-president, J. R. Staley; secretary, Ernest Scagnello; treasurer, George Erb. The association was organized largely to help the cause of good roads and especially the Lincoln highway. The membership fee was fixed at \$5, of which \$4 goes toward the road improvement fund.

Ford, Ohio and G. M. C. Lead—Figures from the state registration bureau show that during the months from January to April 1, 8,330 cars were licensed from St. Louis. Of these cars, 7,569 are gasoline or steamers, 439 are electrics and the balance, 332, are commercial vehicles. One hundred and thirty-eight different makes are represented in the aggregate, twenty-two different types of trucks and fourteen electrics, with 102 gasoline or steamers. The Ford, as usual, had almost five times as many registrations as its nearest competitor; 1,561 Fords were entered on the state books, while the nearest was the Cadillac, with 392. Of the electric cars, the Ohio was the leader, with a total of ninety-two, and the G. M. C., with seventy-seven, is first in the truck registration.

Denver Has Good Roads Disciple—What is regarded as the biggest good roads enterprise ever undertaken by any organization in Colorado has just been launched by the Denver Motor Club, through appointing a road commissioner to travel over the state and promote highway improvement in every section. The commissioner, W. S. Dawson, will lecture on road betterment, demonstrate an inexpensive and effectual method of dragging dirt roads, log and map the most important routes for tourists, extend the marking of roads with signboards and co-operate with county commissioners, motor clubs and all other organizations interested in good roads. The road commissioner will be equipped with a big, powerful car, and will carry with him a model road drag of light and compact construction for use in demonstrating the system of keeping dirt roads in good condition with a split-log drag.

Coming Motor Events

SHOWS AND CONVENTIONS

May 7-9—Convention, National Old Trails Road Association, Indianapolis, Ind.
June 23-26—S. A. E. summer meeting, Cape May, N. J.
September 26-October 6—Berlin show.
October 17-24—Show, Pittsburgh, Pa.
October 16-26—Paris show.
November 6—Olympia show.
November 9-14—American Road Congress, Atlanta, Ga.

CONTESTS

*May 9—Hill climb, Atlanta, Ga.
May 15-16—Track meet, Columbus, O.
May 20—Roadability, Beach Haven, Pa.
May 25-26—Targa Florio race, Sicily.
*May 30—Indianapolis 500-mile race.
May 30—New York track meet.
May 30—Track meet, Providence, R. I.
June 1—Florio cup race, island of Sicily.
June 1—Reliability, Philadelphia, Pa.
June 6-7—Track meet, St. Louis, Mo.
June 10-11—Isle of Man road races, Great Britain.
*June 18—Hill climb, Uniontown, Pa.
June 19—Track meet, Boston, Mass.
June 20—Interclub reliability, Philadelphia, Pa.
June 30—Track meet, Sioux City, Ia.
July 3-4—Road races, Tacoma, Wash.
July 4—French grand prix, Lyons.
*July 3-4—Montamara Feste road races, Tacoma, Wash.
*July 4—Three hundred mile race, Sioux City, Ia., speedway.
July 4—Track meet, Providence, R. I.
July 17-18—Speedway races, Seattle, Wash.
July 25-26—Belgium grand prix road races.
August 15—Le Mans cyclecar grand prix race.
July and August—French army truck subsidiary trials.
August 2-9—Six day cyclecar reliability in French Alps.
August 16—Coupe Internationale; light car race, Le Mans.
August 17—Grand Prix of France, Le Mans.
August 21-22—Road races, Elgin, Ill.
September 5—Track meet, Milwaukee, Wis.
September 6-7—Italian grand prix.
September 7—Track meet, Providence, R. I.
September 9—Speedway races, Pomona, Cal.
September 9—Road race, Corona Beach, Cal.
September 14—Track meet, Milwaukee, Wis.
September 18-19—Track meet, Hutchinson, Kans.
October—Gallion hill climb, Paris.
October 2-3—Track meet, Oklahoma City, Okla.
October 2-3—Track meet, Trenton, N. J.
October 9—Speedway race, Chicago.
November 8-11—Track meet, Shreveport, La.
November 15—Kerosene motor tests, Paris, France.
November—El Paso-Phoenix road race.

* Sanctioned by A. A. A.



Among the Makers and Dealers



WHEEL Company to Move—Arrangements have been completed for removing the plant of the Ideal Steel Wheel Co. of Cincinnati from that city to Elkhart, Ind.

Copyrights Words "Road Smoothers"—The K-W Ignition Co. has copyrighted the words "Road Smoothers" and announces that all infringers will be promptly prosecuted.

Generator Company Changes Name—The name of the Uhrlandt Gas Generator Co. of Columbus, O., has been changed to the Ohio Gas Generator Mfg. Co. The concern manufactures generators for the use of kerosene in motor cars.

Moon Building Five-Passenger Car—The Moon Motor Car Co. of St. Louis now is making a five-passenger car, the first model being placed on the market this week. The company previously built four and six-passenger cars exclusively. The new model has the lines of the streamline light six and is built on the regular six chassis.

Plan Output of 500 Cyclecars—Arrangements are being made by the Hawkins Cyclecar Co. of Xenia, O., to make about 500 Xenias during the present season. Recently a long test of the first cyclecar was made with good success. The test showed a run of 40 miles on a gallon of gasoline.

Opens Two New Branches—The Newlite Mfg. Co. of Newton, Ia., manufacturer of electric lighting systems for motor cars, cyclecars and motorcycles, has opened a Chicago office in the New York Life Insurance building for the serving of the states of Illinois and Indiana and a branch at Los Angeles where stock will be carried for shipment to all western points.

Reduce Working Hours of Men—Gray & Davis has shortened the factory time schedule to 50 working hours per week, instead of 52, as heretofore. This new policy has been put in force because the company wishes to recognize the faithful efforts of its operatives in the discharge of their duty. The new schedule not only increases the personal time of the men, but gives them added remuneration when working after regular hours, and does not in any way involve a reduction in wages.

Establishes Radiator Plant in Detroit—To take care of its rapidly increasing business in Detroit, the Harrison Mfg. Co., Lockport, N. Y., has leased a factory building there and will devote the plant to the making of the Harrison radiator, which heretofore has been manufactured at Lockport. Gould Allen, manager of the Detroit office of the concern, and also representative for the Covert Motor Vehicle Co. of Lockport, which is financed by the same capital, will manage the new Harrison plant.

To Investigate Special Problems—As a means of gathering timely information on a number of important topics the metropolitan section of the Society of Automobile Engineers has organized a number of special research committees. The duties of these committees will be to investigate the present state of the art and industry with respect to each subject, presenting the information thus gathered in the form of a general report to the section. In some instances the findings of the research committees will be in the form of descriptive papers covering important aspects of the matters under investigation. The new committees and the chairmen are as follows: Gas and Electric Vehicles, David Beecroft;

Kerosene Carbureters, A. B. Browne; Greases, H. M. Martin; Non-Electric Continuous Torque Transmission, L. M. Dieterich; Engine Characteristics, James L. Breese; and Governors, Arthur J. Slade.

Takes European Agency for Duryea—The Cresson-Morris Co. of Philadelphia, manufacturer of the Duryea cyclecar, has closed with a company for the entire European territory. The new company will be known as the Duryea International Motor Co.

New Weed Chain Factory—To meet the increasing demand for its product, the Weed Chain Tire Grip Co. has built a plant at Bridgeport, Conn., where all of its activities will be concentrated in the future. The production at present, it is stated, requires the making of 60 miles of chain a day.

B. F. Everitt with Body Builder—B. F. Everitt has entered the Sievers & Erdman Co., Detroit, as vice-president. Mr. Everitt will have the general management of the painting and trimming department, which has just been added to the plant. The company heretofore confined itself to special body work.

Tire Factory for Regina—A factory, the proposed cost of which is \$175,000, is to be erected in Regina, Can., by the Western Tire and Rubber Co., Ltd., work to commence within the next 2 months. A company has been capitalized at \$1,000,000. W. D. Wilson, of Wilson, Lytle and Badgerow, Ltd., of Toronto, is president; E. D. MacCallum, vice-president; J. A. Westman, secretary; and J. O. Sharp, treasurer. The factory will measure 300 by 70 feet, will be two stories in height, and will employ from 300 to 500 hands. The new factory will

have a capacity of from 200 to 300 pneumatic tires a day, as well as a certain amount of belting, hose, truck tires and carriage tires.

Gilson with L. P. C. Motor Co.—James W. Gilson, for several years connected with the Mitchell-Lewis Motor Co., in charge of advertising and publicity, has become associated with the L. P. C. Motor Co. of Racine, Wis.

Tire Companies Declare Dividends—The B. F. Goodrich Co. has declared the regular quarterly dividend of 1½ per cent on the preferred stock, payable July 1 to stock of record June 19. The Swinehart Tire and Rubber Co. has declared a quarterly dividend of 1½ per cent on its stock, payable May 10.

Meigs Leaves Case Company—M. C. Meigs, for several years advertising manager of the J. I. Case Threshing Machine Co., has resigned his position, effective May 15, to join the advertising department of the Chicago Examiner. Mr. Meigs is succeeded as advertising manager of the Case company by D. M. Pettit, who assumes his new duties the middle of the month.

Crescent Car Makes Its Debut—Another St. Louis-made motor car made its appearance in the market last week when the Crescent Motor Car Co. completed its experimental model which is now undergoing the severest tests as a demonstrator. The car is of the streamline type and has no dash lamps. The place of these is taken by small lamps in the headlights. The motor has four cylinders, 3¼x4½ inches. They are cast in pairs. It has a 112-inch wheelbase, right drive and center control.

Recent Incorporations

Akron, O.—Lincoln Rubber Co., capital stock, \$10,000; to manufacture rubber goods; incorporators, J. Hadfield, I. Hadfield, W. E. Slabaugh, M. Seiberling, S. A. Allen.

Alexandria, Va.—Central Automobile Co., capital stock, \$1,000; incorporators, W. H. Heymel, J. A. Eggborn.

Beloit, Wis.—Lipman Air Appliance Co., capital stock, \$100,000; to manufacture air compressors; incorporators, C. E. Ernst and E. K. Lipman.

Boston, Mass.—Beacon Motor Supply Co., capital stock, \$10,000; incorporators, C. F. Munn, J. B. Belford, L. G. Carlton.

Bristow, Okla.—Americo-Syrian Petroleum Co., capital stock, \$25,000; incorporators, K. Wasaff, J. G. Adamie, J. Abraham.

Buffalo, N. Y.—Automobile Accessories Co., capital stock, \$25,000; incorporators, T. R. Thomas, W. N. Linford, A. B. Floyd.

Canal Dover, O.—Braun-Hoff Electrical Co., capital stock, \$50,000; to manufacture and deal in motors and electrical apparatus; incorporators, W. A. Braun, J. D. Baker, S. L. Holmes, C. E. Kretler, O. A. Keyser.

Central City, Ky.—Barnes Automobile Co., capital stock, \$15,000; incorporators, P. Barnes, J. L. Leach, C. V. Lisle.

Cleveland, O.—United States Air Compressor Co., capital stock, \$25,000; to manufacture air compressing machinery; incorporators, R. L. Bucher, G. A. Hunter, W. G. Smith, W. W. Beauman, L. H. Bacher.

Hartford, Conn.—Capital Auto Sales Co., capital stock, \$50,000; incorporators, J. J. Carroll, A. M. Quinn, E. J. Clemons.

Ithaca, N. Y.—J. H. Bailey Garage Co., capital stock, \$10,000; incorporators, A. E. Bailey, J. H. Bailey, G. W. Reynolds.

Louisville, Ky.—Motor Sales Co., capital stock, \$6,000; incorporators, H. O. Herr, R. W. Herr, Jr., A. W. Lee, Jr.

Louisville, Ky.—Dixie Auto Supply Co., capital stock, \$5,000; incorporators, A. H. Drake, H. Jansen, J. A. Kolb, Jr.

Mechanicsville, N. Y.—Herreshoff Light Car Co., capital stock, \$100,000; to manufacture cars; incorporators, C. E. Herreshoff, N. R. Holmes, A. L. Johnson.

New York—Globe Ball Bearing Co., capital stock, \$500,000; to manufacture bearings; incorporators, G. W. Carroll, C. F. Bultemeyer, R. Royall.

New York—E. D. C. Auto Corp., capital stock, \$2,000; incorporators, E. D. Carrington, G. D. Carrington, A. B. Carrington.

New York—Emme, Young & Co., capital stock, sporting goods and motor car supplies; incorporators, H. D. Emme, E. C. Young, E. Day.

New York—Duryea International Motor Corp., capital stock, \$50,000; incorporators, H. S. Owen, B. Thomas, W. R. Root.

New York—Rubber Tire Accessories Co., capital stock, \$10,000; incorporators, O. Earhart, T. J. Nugent, S. K. Ellenbogen.

New York—Engel Engine Corp., capital stock, \$100,000; to manufacture internal combustion engines; incorporators, H. Engel, W. L. Smith, J. M. Hanford.

Providence, R. I.—Providence Auto Exchange, capital stock, \$100,000; incorporators, C. Campbell, J. Campbell, H. Rosner, H. Morrow.

Richmond, Va.—Szekely Cyclecar Co., capital stock, \$50,000; incorporators, H. F. Bernhard, E. J. Bernhard.

Ripley, N. Y.—Burrows Cyclecar Co., capital stock, \$30,000; incorporators, J. W. Burrows, R. P. Burrows, R. Burrows.

Roanoke, Va.—Shenandoah Motor Sales Co., incorporators, S. S. Brooks, S. P. Sanders.

Springfield, Mass.—George Smith Plumbing & Auto Metal Co., capital stock, \$50,000; incorporators, J. J. Moynihan, George Smith, M. H. Smith.

Toronto, Can.—Watson Cyclecar Co., capital stock, \$100,000; incorporators, S. A. Watson, E. Knox, C. Inrig.

Toronto, Can.—Favary Tire Co., Ltd., capital stock, \$500,000; to manufacture and deal in machinery and supplies; incorporators, F. Kitching, F. V. Clisdell, A. W. Briggs, H. E. Gosch, E. M. Dillon, D. H. Arnott, R. J. Young.

Tulsa, Okla.—Hi-Grade Gasoline Co., capital stock, \$1,000; incorporators, B. Revel, D. C. Rose, R. S. Fellows.

Wellesley, Mass.—Lower Falls Garage Co., capital stock, \$5,000; incorporators, A. L. Barr, G. R. Williams, N. J. McGaffin.

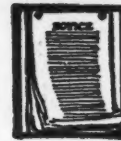
Wellsville, N. Y.—Wellsville Garage, capital stock, \$6,000; incorporators, H. S. Higgins, H. S. Burns, K. B. Covell.

White Plains, N. Y.—Prawaup Tire & Repair Co., capital stock, \$1,000; incorporators, R. J. Rennie, N. M. Gidley, J. J. Hayde.

Youngstown, O.—East Ohio Auto Sales Co., capital stock, \$10,000; to deal in motor cars; incorporators, M. H. Squires, A. Kessler, B. O. Shulman, L. J. Shulman, S. J. Yarny.



Brief Business Announcements



COLUMBUS, O.—The Hays Punctureless Tire Co. of 203 East Town street has taken the agency for the Standwell demountable rims for Ford cars.

Seattle, Wash.—A branch of the Commerce Motor Car Co., manufacturer of light delivery cars, has been established at Seattle, with Frank C. Carey as manager.

Detroit, Mich.—The Acklin Stamping Co., Toledo, has opened a Detroit office at 929 Ford building, with W. C. Acklin, secretary of the company, in charge. The concern makes metal stampings for motor cars.

San Francisco, Cal.—E. E. Jeffress, for some years past identified with the tire trade in San Francisco, has recently formed a partnership with Chris Schmid, under the firm name of the Schmid-Jeffress Co., in San Francisco.

Norwalk, O.—E. E. Sly, agent for the Ford and proprietor of a garage conducted under his name on Woodlawn avenue, has sold the business to William and Daniel Smith of Hartland, O., who took charge at once. Mr. Sly retires from the garage business to devote his entire time to exploiting a valve for motor cars.

Boston, Mass.—The New England branch of the Ford Motor Car Co. celebrated 8½ years of existence by moving into its handsome new assembling plant just across the river in Cambridge at the junction of the Charles River parkway and Boylston street last week. The building vacated by the

company is practically new, for it has been used but 2 years and it was built to order for the local Ford branch.

Pittsburgh, Pa.—The Apperson Bros. Automobile Co. has opened a direct factory branch here at 2977 Center avenue, with Nelson B. McLane as manager.

Tacoma, Wash.—F. P. Smith, formerly with the Studebaker company in Tacoma, has recently opened the Tacoma Auto Exchange at 1129 Tacoma avenue.

Columbus, O.—Howard E. Sullivan, manager of the Keystone Vehicle Co. of Columbus, recently incorporated, has located a repair shop at 36-38 West Swan street.

St. Louis, Mo.—C. M. Pachman last week took active charge of the St. Louis branch of the General Motors Truck Co. He formerly was Kansas City manager of the Kelly-Springfield Motor Truck Co.

Albany, N. Y.—H. W. Maclellan, who has been Troy district manager for the E. V. Stratton Co., has been promoted to sales manager of the company, with headquarters at Albany. Herbert E. Listman, of the Franklin agency, has succeeded Mr. Maclellan in Troy.

Ford, Ont.—B. W. Vallat has been chosen vice-president of the Dominion Stamping Co. at Ford. The concern is a subsidiary of the Michigan Stamping Co. of Detroit, which specializes in aluminum and sheet metal stamping and drop forgings. Extensive additions are to be made to the Ford

plant to take care of the Dominion company's rapidly increasing business. Mr. Vallat was formerly superintendent of the Newport Mining Co. of Ironwood, Mich.

Chicago—The Sheldon Axle Co., Wilkes-Barre, Pa., has moved its local office from 68 East Twelfth street to the People's Gas Light building, corner Michigan boulevard and Adams street.

New York—The general offices of the United States Light and Heating Co., at 30 Church street, New York, will be moved May 20 and located thereafter at the company plant at Niagara Falls, N. Y. This transfer will result in bringing together the administrative, sales, engineering and production departments.

Seattle, Wash.—The Seattle Automobile Dealers' Association was organized during the past week and the following officers were elected to serve for 3 months: President, George W. Miller; secretary, A. S. Eldredge and treasurer, L. G. Nicolai. At the present the intention is to make the association mainly social in character.

Boston, Mass.—George Hudson, manager of the New England branch of the American Locomotive Co., has been made manager of the new gasoline branch of the General Vehicle Co., to handle the Mercedes truck. Day Baker retains the managership of the General Vehicle electric truck department. The headquarters have been moved from 84 State street, Boston, to the Shoe and Leather Exchange building in Cambridge.

Recent Agencies Appointed by Motor Car Manufacturers

PASSENGER CARS

Town	Agent	Make	Town	Agent	Make
Allentown, Pa.	V. H. Steckel	Herff-Brooks	Gordon, Neb.	B. M. Wilhite	Car-Nation
Alexander, Ia.	W. H. McDowell	Oakland	Harrisburg, S. D.	Theodore Dempewolf	Hupmobile
Ada, Minn.	Norman County Auto Co.	Maxwell	Hayesville, Ia.	R. R. Jacobs	Maxwell
Alma, Neb.	W. B. Ralston	Hupmobile	Hancock, N. Y.	Bell & Taylor	Maxwell
Bluffton, O.	Herbert Basinger	Maxwell	Ida Grove, Ia.	Julius Sauer	Maxwell
Belleville, Pa.	L. M. Yoder	Herff-Brooks	Jefferson, O.	A. F. Sikes	Maxwell
Broken Bow, Neb.	G. Ream	Paige	Kalamazoo, Mich.	Louis E. Kraft	Franklin
Bradford, Pa.	Standard Garage	Herff-Brooks	Leetonia, O.	Auto Machine Co.	Franklin
Birmingham, Ala.	W. W. Robinson	Franklin	Lexington, Ill.	Tilsen Patton	Oakland
Beaver Crossing, Neb.	Watts & Owens	Maxwell	Marshallville, O.	T. E. Steiner & Son	Herff-Brooks
Batesville, Ind.	Pohlar Auto Co.	Maxwell	Merriman, Neb.	Metzger Brothers	Hupmobile
Chatham, N. Y.	J. W. Darrows	Maxwell	Miami, Fla.	Belcher & Brown	Herff-Brooks
Coaticook, Que.	Chesley & Hull	Maxwell	Massena, Ia.	N. H. Yarger	Car-Nation
Caney, Kan.	Todd Hardware & Supply Co.	Maxwell	Manning, Ia.	R. E. Dudgeon	Car-Nation
Columbus, Neb.	J. Luxa	Paige	Milnor, N. D.	J. K. Taylor	Maxwell
Chadron, Neb.	E. T. Morcy	Car-Nation	Mapleton, Minn.	Borchert Brothers	Maxwell
Curtis, Neb.	R. A. Conover	Car-Nation	Mount Morris, Ill.	Arthur E. Clevidence	Maxwell
College Corner, O.	J. F. Bishop	Herff-Brooks	Moberly, Mo.	L. P. Hoffman	Maxwell
Clark, S. D.	Floyd Mahan	Hupmobile	Ontario, Cal.	F. A. Saunders	Maxwell
Campbellsport, Wis.	Campbellsport Implement Co.	Maxwell	Ottoville, O.	Huysman & Osenga	Herff-Brooks
Columbia, Mo.	F. W. Neidermeyer	Maxwell	Polo, Mo.	C. C. Bland, Jr.	Maxwell
Clatonia, Neb.	H. L. Lohmeyer	Maxwell	Plainwell, Mich.	Ingraham & Travis	Maxwell
Coldwater, Mich.	McNaughton & Warner Co.	Maxwell	Provo, Utah	Dell Chipman	Maxwell
Crawford, Neb.	J. J. Adams, Jr.	Maxwell	Reliance, S. D.	A. R. McMullen	Car-Nation
Carbondale, Colo.	W. M. Dinkle Merc. & Lbr. Co.	Maxwell	Raton, N. M.	G. D. Siemantel	Maxwell
Decatur, Ill.	Jones & Rehling	Herff-Brooks	Rushmore, Minn.	F. G. Herman	Maxwell
Danbury, Ia.	Fred Kann	Maxwell	Rhineland, Tex.	Peter Loran	Maxwell
Decatur, Ill.	Dawson Auto Co.	Maxwell	Rialto, Cal.	John M. Bradford	Maxwell
Dodge, Ia.	E. Kubick	Paige	Sidney, Neb.	Livoni & Son	Maxwell
Denmark, Wis.	Kriwanek Brothers	Oakland	Shinglehouse, Pa.	Grand Central Garage	Maxwell
Esparto, Cal.	Esparto Garage Co.	Maxwell	Springfield, O.	Jordan Motor Sales Co.	Herff-Brooks
Easton, Pa.	Wilson Auto Co.	Herff-Brooks	Trinidad, Colo.	Trinidad Garage Co.	Maxwell
Edgerton, O.	Arthur Krill	Herff-Brooks	Trivoli, Ill.	E. H. Kessler & Sons	Maxwell
Fort Madison, Ia.	W. A. Arnold	Herff-Brooks	Utica, N. Y.	Lawrence J. Zobel	Herff-Brooks
Friend, Neb.	William Vossler	Hupmobile	Woodsville, N. H.	Burbeck & Young	Maxwell
Gardner, Mass.	L. Herbert Oarcher	Maxwell	Waterbury, Neb.	C. E. Armstrong	Maxwell
Geronimo, Tex.	Alfred Koebig	Maxwell	Xenia, O.	G. C. McClain	Krit
Golconda, Ill.	W. S. & C. Motor Co.	Maxwell	Youngstown, O.	Cartercar Sales Co.	Herff-Brooks
Graham, Cal.	E. L. Zimmerman	Maxwell	York, Neb.	E. S. Clark	Chandler
Gravity, Ia.	Clyde Wilson	Chandler	Yale, Ill.	J. L. Forester	Maxwell



The kind of customers you want

—high-grade, intelligent motorists—these are the people who buy Republic Tires.

They're the best people in your town—that's why they pay more and get the best tire.

An agency for Republic Tires will put you in a position to go after these quality buyers with a quality tire—and keep their trade, because

- Republics deliver the mileage;
- Republics make repeat orders certain;
- Republics pay back over and over again, in increased service, the small extra first cost.

Write us for our proposition. The weathervane of Tiredom is pointing toward Quality. Get the Republic Agency—and your tire success is assured.

The Republic Rubber Company, Youngstown, Ohio

Branches and Agencies in All the Principal Cities

REPUBLIC MILEAGE

PLAIN AND STAGGARD TREAD

TIRES



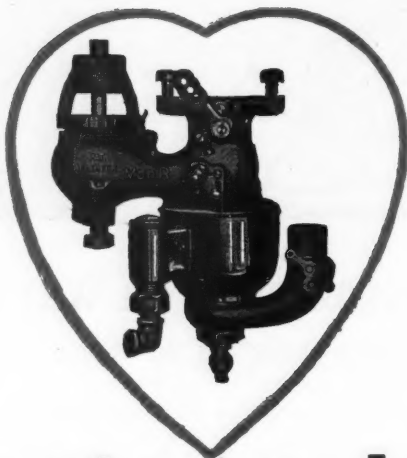
REPUBLIC
WM TREAD TIRES

Here is the baby of the Republic Family. He's a quality tire, too, made in 3 sizes, designed especially for small cars. Here are his specifications:

30x3	Price, \$13.50
30x3 ½	Price, \$18.00
32x3 ½	Price, \$19.50

REPUBLIC
5746440
TREAD
PAT. SEPT. 15, 22
1908

1,500,000 SCHEBLER

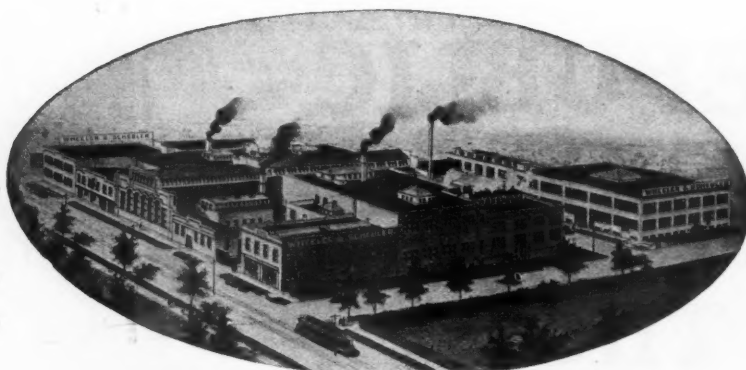


Carburetors In Use!

When a motor mechanic sees a Schebler on a motor he welcomes it as an old friend.

Do you want service and satisfaction? We give service—our instruments satisfaction.

The
Factory
Behind—



The
Schebler
Carburetor

Daily Capacity, 4000 Instruments

WHEELER & SCHEBLER, Indianapolis, Ind.

"Pioneers in Perfection of Carburetion"

BRANCHES:

Fry & McGill Motor Supply Co. Denver, Colo.
Automobile Accessories Co. Pittsburgh, Pa.
Ferris-Dunlap Auto Supply Co. Dallas, Tex.
Interstate Electric Co. New Orleans, La.
Reinhard Bros. Co. Minneapolis, Minn.

Manufacturers' Supply Co. Philadelphia, Pa.
Weinstock-Nichols Co. Los Angeles, Cal.
Pennsylvania Rubber & Sup. Co. Cleveland
Wheeler & Schebler. Chicago
Wheeler & Schebler. Detroit

Fred Campbell. St. Louis, Mo.
W. J. Connel. Boston, Mass.
Equipment Co. Kansas City, Mo.
Elyea-Austell Co. Atlanta, Ga.
J. C. Nichols. New York City
Weinstock-Nichols. San Francisco

Fairbanks, Morse & Co., Ltd., London, England
Canadian Fairbanks-Morse Co. (All principal Canadian cities)

When Writing to Advertisers, Please Mention Motor Age.

KLAXON



The Klaxet \$12

A SMALLER KLAXON
(MOTOR DRIVEN)

A TIP FOR OVERLAND DEALERS

Overland buyers can be sold Klaxons if you keep in close enough touch with them to know when their electric "vibrator" horns go back on them.

At the time they buy their car they may not be Klaxon prospects. They may not then know what the "vibrator" or "buzzer" horn is.

But when they find out—when they try to make it *carry* in the country—or get quick action in the city—when the contact points burn out; then—

Then show them the Klaxet. Let them hear it—not in your store, but *on the road*. Let them take

one on trial—and discover its *warning power*—its *carrying power*.

Tell them how it is made how it cannot wear out how it is guaranteed *indefinitely*—by a company ready and willing and glad to *make good* on it should it ever cause trouble—a company in business to stay.

Someone is going to sell Klaxons to Overland owners. It might as well be you. If you think so write for Klaxon selling plan.

LOVELL-McCONNELL MFG. COMPANY, MAKERS OF THE "KLAXON," NEWARK, N.J

THE Detroit ELECTRIC

The Electric That Experts Choose

Consider this list of men who own Detroit Electric Cars

THOMAS A. EDISON, greatest electrical genius of the age.

DR. CHARLES P. STEINMETZ, the wizard of the General Electric Company.

HENRY FORD, President, Ford Motor Company.

HENRY B. JOY, President, Packard Motor Car Company.

C. J. MOORE, Operating Manager, Packard Motor Car Company.

C. H. WILLS, Factory Manager, Ford Motor Company.

LEE COUNSELMAN, Vice-Pres. and Gen. Mgr., Chalmers Motor Company.

GEO. W. DUNHAM, Chief Engineer, Chalmers Motor Company.

J. FRANK DURYEA, Vice-Pres. and Factory Mgr., Stevens-Duryea Automobile Company.

HOWARD MARMON, President, Nordyke & Marmon Company.

S. J. KUQUA, Vice-Pres., Cole Motor Car Company.

J. WALTER DRAKE, President, Hupmobile Motor Car Company.

GILBERT W. LEE, Director, Lozier Motor Company.

CHARLES J. BUTLER, President, Morgan & Wright Company.

The choice by these men—authorities every one of them—forms the greatest tribute ever paid to the Detroit Electric. These experts know automobile values; they understand mechanical construction; they are familiar with materials; they require style and sheer intrinsic merit in the electric they drive.

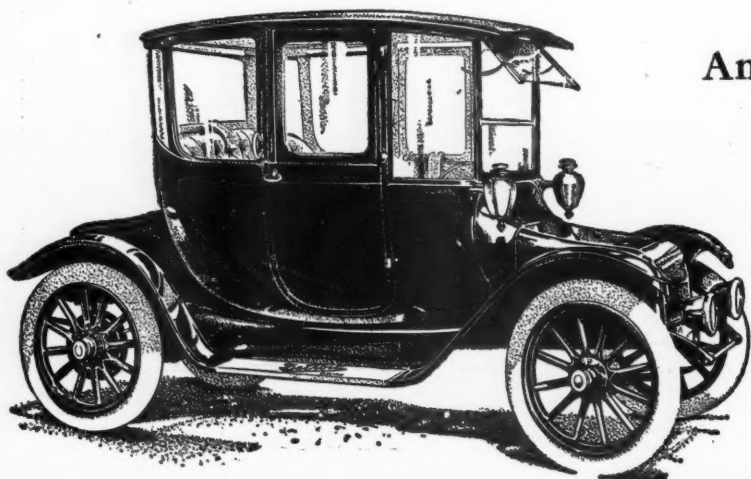
And their experience has led them to choose the Detroit Electric above all others.

Like other owners of Detroit Electric cars, these experts can afford, and are used to having, the best.

They had all the electric cars in the world to choose from—some from \$300 to \$500 higher in price than the car they selected. They bought the Detroit Electric because they considered it the best electric on the market regardless of price.

This is only natural, for the Detroit Electric is built, actually manufactured, not merely assembled—in the greatest electric pleasure car factory in the world. Behind it stands the largest and strongest concern in the electric car business.

Dealers: The best electric to buy is the best electric to sell. In considering which electric car to handle, fix this point in your mind: Every third electric car built and sold today is a Detroit Electric. Write for literature and the Detroit Electric opportunity to dealers.



**Anderson Electric Car Co.
Detroit**

Builders of the Detroit Electric

World's Largest
Manufacturers of Electric Pleasure Vehicles

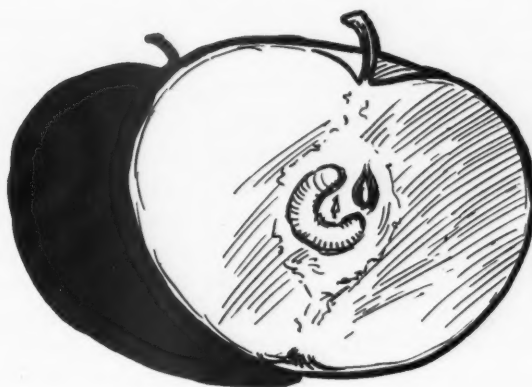
COMPARISONS



Two Apples
May Look
Exactly Alike
on the Outside

BUT

How
About



The
Core?

Two Electric Starting and Lighting Systems may, to the unskilled eye of the car owner, look exactly alike.

And as far as concerns many accessories, they may be alike, one just as good as the other.

But down in the core, there's a little Storage Battery, upon which, insignificant as it appears, depends the successful operation of the whole car.

Discriminating car buyers who know, realize the vital importance of the storage battery, and will not accept, without question, any old thing that comes with the car.

Nearly all car manufacturers, however, have tried, tested, proven and adopted the **GLBA** as the standard of excellence.

So examine the core of the electric system on the car you buy and look out for worms.

If you don't find an **GLBA** battery there just remember that you are not getting the Storage Battery that the experts have pronounced the best.

Insist on having an **GLBA** and make your dealer furnish it.

If he refuses, it's because the other is cheaper and you may rest assured the car is cheapened elsewhere.

Makers of good, reliable cars all furnish the **GLBA** Battery.

GLBA

Willard Storage Battery Co., Cleveland, Ohio

GLBA

New York Branch: 136 W. 52nd St.
Chicago Branch: 2241 Michigan Ave.

Indianapolis Branch: 438 and 439 Indiana Pythian Bldg.

Detroit Branch: 736-740 Woodward Ave.
San Francisco Branch: 243 Monadnock Bldg.

SERVICE STATIONS IN ALL PRINCIPAL CITIES IN THE UNITED STATES, CANADA AND MEXICO.

(99)

**Entirely
Concealed
Under the
Hood**

FORD OWNERS CAN NOW HAVE THE SELF-STARTING CONVENIENCE OF THE LARGER AND MORE EXPENSIVE CARS

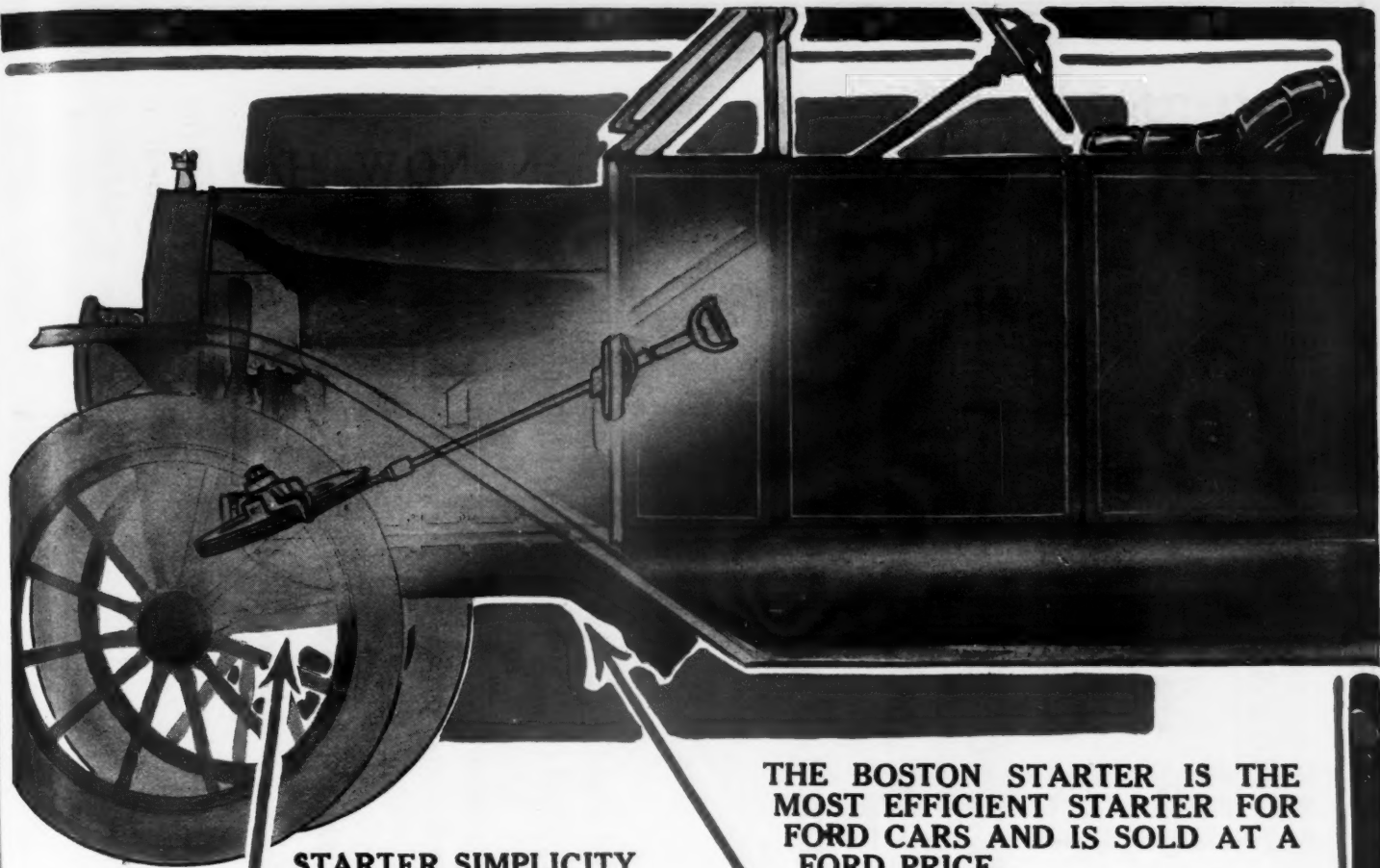
Nothing in the whole field of American mechanical genius has brought more comfort and widened the field of enjoyment within the reach of the average American citizen than the Ford car. The combination of the small purchase price and low cost of up-keep proves the Ford car in many respects the greatest of all makes of car. It is the rich man's greatest auxiliary as well as the poor man's greatest convenience. It lacks, however, the one real labor saving and comfort giving device added to the gasoline motor car within recent years. It cannot be started from the driver's seat. The ability to start the Ford motor from the driver's seat is the one needed addition to a Ford car. The Boston Starter for Ford motors fills this greatly desired gap and thousands of Ford owners are now using it daily with great satisfaction. The Boston Starter is a complete equipment. It is built into the Ford car and becomes a part of the Ford motor, being carefully fitted ready for immediate application. It can be attached by anyone accustomed to the use of the simplest tools in an hour or two.

The Boston Starter is being operated all over the land from Eastport, Maine, to San Francisco, California, with great appreciation by men and women, and even children. It is always ready for operation, having no springs to unwind or batteries to run down. Once properly installed, it is always ready for instant use. Does not change the appearance of the car, or interfere with the use of regular crank, as the regular crank can be carried in the tool box, where it belongs.

**Complete
\$ 25 00
Ready to
Install**

(F.O.B. Boston)

154R



STARTER SIMPLICITY

The Boston Starter is a surprisingly simple device, guaranteed by its manufacturers without hesitation to start the Ford motor a larger percentage of times than other more complex and expensive starters; which means that the Boston Starter is the most efficient and practical starter on the market for Ford cars. Every time you stand in the rain or mud to crank your car, remember the Boston Starter. Whenever your motor backfires, remember the Boston Starter. Think of the relief when you realize that no injury can come to your wife, children or sweetheart when using your Ford car, as all danger from back-fire from the use of the ordinary crank is eliminated.

THE BOSTON STARTER IS THE MOST EFFICIENT STARTER FOR FORD CARS AND IS SOLD AT A FORD PRICE.

It is the simplest to attach, the lightest in weight, the most reliable for a long period of time—outliving the car, and the safest to operate. You can attach it yourself in a very little while, or have it done by any mechanic. You can buy it complete from your dealer ready to install for \$25.00 (F. O. B. Boston).

If your dealer cannot supply you, write us direct at once.

Automatic Appliance Company,

172 Columbus Ave., BOSTON, MASS. 1876 Broadway, NEW YORK, N. Y.

LIST OF DISTRIBUTORS

PORTLAND, OREGON,
S. G. Morrison,
738 Morgan Bldg.
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Boston Starter Company
of Kentucky,
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79 Ninth Street.
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Robert W. Butler,
4529 Park Heights Ave.

DENVER, COLO.,
Bert E. Clark,
1616 Broadway.
SCHENECTADY, N. Y.,
Dorp Auto Company,
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BUFFALO, N. Y.,
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Cheml Company,
629 E. Main Street.
AUTOMOBILE SUNDRIES
CO., 18 Broadway,
New York, N. Y.
Sole distributors for ex-
port.

**Works
Every
Time**

**Easily
Operated**

Yes, Premier Is Building the Simplest, Most Economical, the Most Powerful Six Cylinder Motor of its Size and Weight, but it is also Building Something More and this Advertisement is Written and Printed to Point Out That the Premier-Weideley Six not Only Leads in Engine Efficiency and Economy but Also in Chassis Construction and Durability.

AND when we say chassis, we mean frame, axle, steering gear, springs, wheels, transmission, down to the last bolt and cotter pin.

The business of a good motor car is to run, to run smoothly, silently, with a maximum of carrying capacity

and a minimum of wear and tear—to withstand the shock of rough roads and the strain of hill-climbing without halt or breakdown, to render silent service at all times, under all normal conditions, and to do all this without disclosing weakness or excessive wear in either moving or rigid parts.

The History of Premier Automobiles is the History of Progressive Quality Construction

No inferior or doubtful metal or mechanical part ever entered into Premier construction, and while it might have been easy to save or substitute, and at times without apparent risk or danger, we have found it wise to stand up firmly and always maintain the highest quality standard, if for no other reason than it was profitable for us to do so.

to our dealers, and the supreme satisfaction of giving the man who had bought our product his money's worth to the last penny.

And Premier owners have been loyal to this superb product, they have properly promoted the sale of other Premier cars to their friends by saying to them: "Buy a Premier.

Whatever we expended for better material and better workmanship we saved in the non-replacement of parts, in the better service to our patrons, in the lessened expense

It will give you service." When they got through with their first Premier they came back for another Premier.

It will give you service." When they got through with their first Premier they came back for another Premier.

Whatever we expended for better material and better workmanship we saved in the non-replacement of parts, in the better service to our patrons, in the lessened expense

The Man who Buys a Premier Product is Buying Well—He Cannot Buy a Better Car at Any Price—He Cannot Buy any Other Car as Good at the Same Price

The Premier-Weidely Six has caused a great commotion wherever men who talk of automobiles and deal in them foregather.

There has been so much emphasis laid on the wonderful engineering achievement of the Weidely motor that we believe it important to go further and point out the other great values in Premier construction.

The price is \$2700 F.O.B. Indianapolis. The general specifications are as follows:

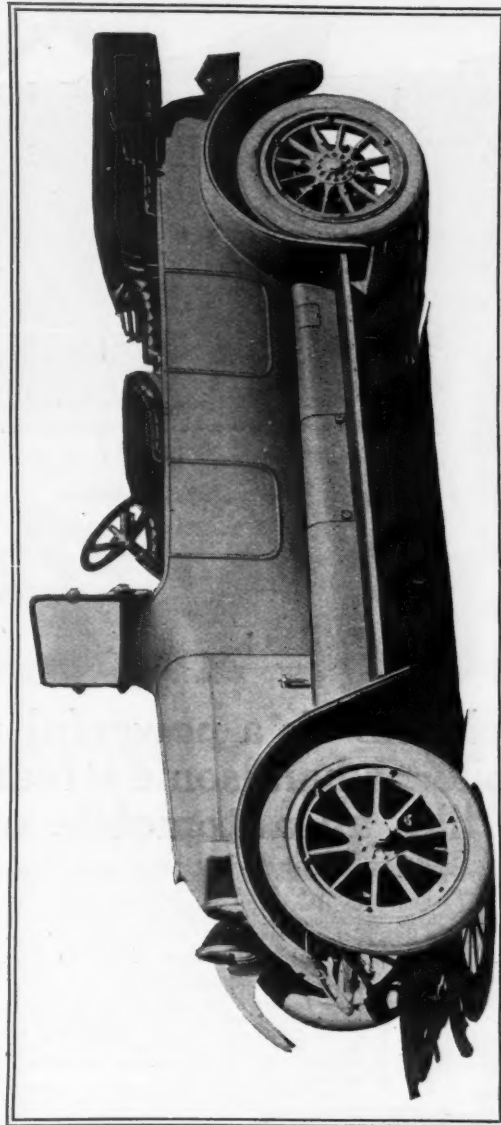
Motor: 6 cylinders in one block, 3 $\frac{3}{8}$ "x5 $\frac{1}{2}$ "; 31 to 75 horsepower; unit power plant; fly wheel inclosed; 3-point suspension.

Electric starter; electric lights; gear driven tire inflater; 132" wheel base; 36"x4 $\frac{1}{2}$ " tires; front springs semi-elliptic, 36" long; rear, semi-elliptic, 36" long, with shackled ends; fitted with shock absorbers, recoil straps and rubber bumpers; steering, left side; control, center; clutch, multiple disc; drive, shaft; lubrication, pressure and splash system.

The demand for Premier-Weidely sixes is overwhelming. We are being literally besieged by buyers and

dealers who want early demonstrations and deliveries. Patience, gentlemen; we are operating under "forced draught." Premier-Weidely sixes are coming through, we are going to take care of you all.

Special to Dealers in Open Territory.—You are urged to file your application for information and details on the Premier-Weidely six without delay. We have already



been obliged to decline many highly desirable agency connections, because the applicant was too late.

The Premier-Weidely six automobile is **\$2700** F.O.B. Indianapolis, and a higher price will not buy a better car anywhere else in America.

Premier Motor Mfg. Co., Indianapolis, Ind.



Maxwell 25

The Maxwell "25" is a powerful automobile—a real, full-grown automobile—a handsome stream-line automobile, and it looks and acts like an automobile of three times the price.

The Maxwell "25" has absolutely every essential quality, and absolutely every necessary feature found in the very highest priced cars.

In actual economy of operation, in real ability to keep out of the repair shop, it not only equals, but surpasses most cars which cost five times its price.

The Maxwell "25" weighs 1685 pounds. A wonderful "tire economy car." Has 30x3½-in. tires. FRONT and REAR, permitting rear tires to be shifted to front wheels to give extra long service.

The motor is cast enbloc; 3½-in. bore; 4½-in. stroke; adjustable valves completely inclosed. Extra large crank shaft; bearings of bronze with babbitt lining.

Motor water cooled, will not overheat.

More Power for Its Weight Than All Higher Priced Cars

The Maxwell "25" has a real 25 horsepower motor—which develops more power in proportion to the weight of the car than the engines of most \$5,000 automobiles.

The Maxwell "25" can pass most any car on hills "in high."—It is a phenomenal hill climber.

Costly High Tension Magneto—Like Highest Priced Cars

The Maxwell "25" has a Simms high-tension magneto, which always delivers the spark direct to the spark plugs in correct time. This means no coils—NO MAKE-SHIFT MASTER VIBRATORS—no mechanism that requires frequent delicate adjustments. The magneto works right, and stays right.

Transmission—4 Speed Selective Sliding Gear, Center Control

The Maxwell "25" has a 4 speed selective type

transmission, 3 speeds forward and 1 reverse. The main shaft has HYATT ROLLER BEARINGS at front end—bronze bushing babbitt lined at rear. Adjustable cone clutch is lined with motobestos. It takes hold firmly without sudden gripping, and without undue noise.

Control—Brakes of Extra Strength

The Maxwell "25" has left-side, 16-inch steering wheel. There is plenty of room for a big man to drive without being cramped. Spark and throttle control rods are inclosed in steering column. There is a foot throttle or accelerator pedal with foot rest. Transmission Control Lever is in CENTER OF CAR and is OPERATED BY THE RIGHT HAND.

THE SERVICE BRAKE IS CONTRACTING and the EMERGENCY BRAKE EXPANDING. They act on 12¼-inch brake drums bolted to rear wheels.

Unfailing, Economical, Springless Atomizer Type Carburetor

The Maxwell "25" has a Zephyr Carburetor—Atomizer Type. This gives unusual high mileage per gallon of gasoline without constant carburetor trouble. Starts and runs right in any weather, and controlled from the dash.

Lubrication—Improved Splash System With Oil Saving Pump

The Maxwell "25" has splash lubrication with a sturdy, slow-moving plunger pump. This saves oil.

Capacity—A Real 5-Passenger Car of Comfort

The Maxwell "25" is a real 5-passenger car. It carries 5 grown people comfortably. There is plenty of leg room.

Phenomenal Easy Riding Qualities

The Maxwell "25" has 4 SEMI-ELLIPTIC TYPE SPRINGS. The front springs are 32 inches long. The rear springs are 40 inches long, fixed at front, shackled at rear, and mounted on a rocking seat. ABSOLUTELY NO EXPENSIVE SHOCK ABSORBERS OR AUXILIARY SPRINGS ARE NEEDED.

Fullest Equipment—Complete and of Unusual Quality

The Maxwell "25" has a perfectly fitted top with envelope. The top has the famous "Jiffy Curtains," which fold back in the top and can be let down in an instant without getting out of car.

Full equipment of handsome lamps, Prest-O-Lite tank, full set of tools, jack, pump, Stewart speedometer, etc. A strong, good-looking tire carrier comes on the back of the car.

You have no extras to buy. Everything comes with the car.

See the Maxwell dealer in your town at once, and look at this wonderful complete car. IF THERE IS NO MAXWELL DEALER NEAR YOU, WRITE FOR INTERESTING, ILLUSTRATED, DESCRIPTIVE CATALOGUE.

Address Dept. E

Maxwell Motor Co., Inc.

Detroit, Michigan

FULL \$ EQUIPMENT

DEALERS: This is a sample of our great national advertising campaign on the Maxwell "25"

When Writing to Advertisers, Please Mention Motor Age.

Ford Dealers!

Our special proposition
on the new Stewart Speedometer
for Ford Cars
will enable you to supply every
new Ford owner with a high-
grade Satisfactory Speedometer.
Telegraph our nearest
Branch office Today!

Stewart-Warner Speedometer Corporation

Executive Offices: 1931 Diversey Boulevard, Chicago

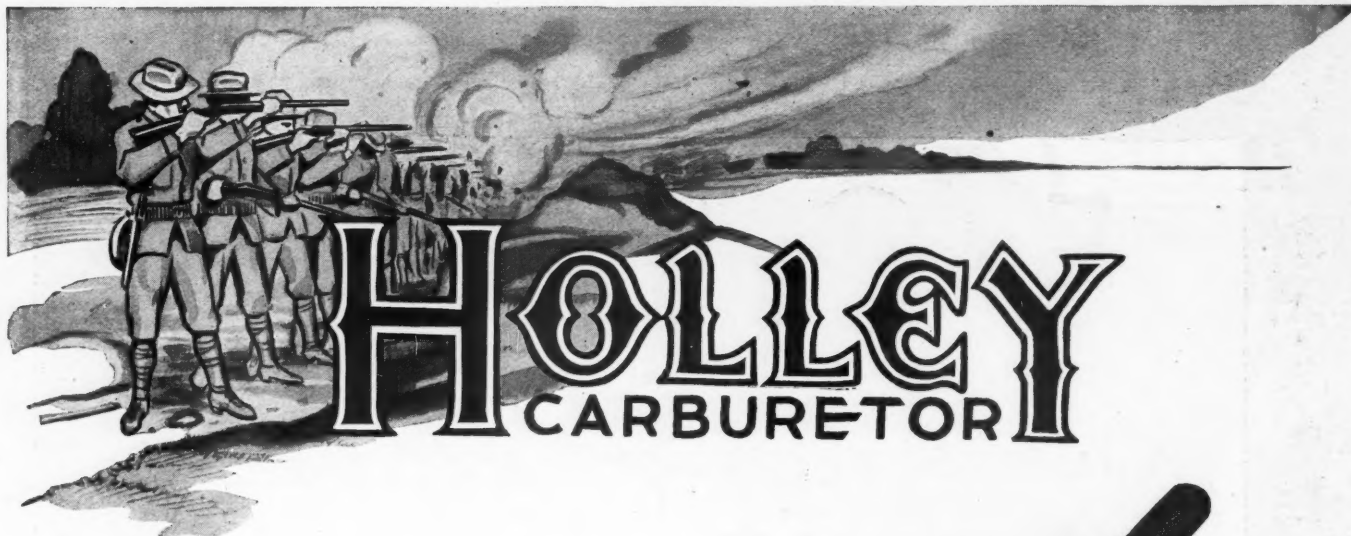
Factories: Chicago and Beloit, Wis.

Branches:

Atlanta, Ga., 399 Peachtree St.
Boston, Mass., 1111 Commonwealth Ave. and 8-10
Brighton Ave.
Buffalo, N. Y., 729 Main St.
Chicago, Ill., 1312 Michigan Ave.
Cleveland, Ohio, 1831 Euclid Ave.
Detroit, Mich., 1235 Woodward Ave.
Indianapolis, Ind., 514 N. Capitol Ave.
Kansas City, Mo., 1825 Grand Ave.

London, England.
Los Angeles, Cal., 115 E. 10th St.
Minneapolis, Minn., 635 Third Ave., S.
New York, N. Y., 243 W. 58th St.
Paris, France.
Philadelphia, Pa., 608 N. Broad St.
Pittsburgh, Pa., 301 N. Craig St.
San Francisco, Cal., 1447 Van Ness Ave.
St. Louis, Mo., 3333 Olive St.

Service Stations in all cities and large towns



GUN makers have found springs most unreliable.

They have not been able to perfect a spring that is not affected by heat or cold.

They say that it is not unusual for the main spring of the gun to snap into pieces, even when the gun is not in use.

Springs become weak and treacherous.

According to the Encyclopedia Britannica, some military rifles have been absolute failures because of the unreliable features of their springs.

Springs are used in gun locks because nothing better has been found to take their place.

Springs have been used in carburetors for the same reason until recently.

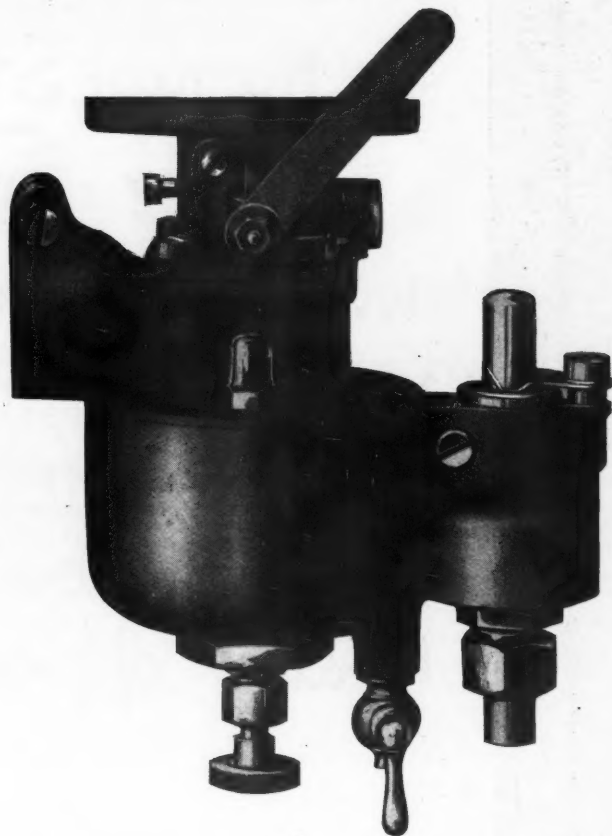
The new self-adjusting Holley has no springs.

It depends entirely upon natural forces of gravity and air pressure for its operation—hence, it is accurate and reliable.

225,000 now in use.

One on your car will pay for itself in 5,000 miles of driving.

See our nearest dealer or write direct to



REO ACCESSORIES CO., 1220 Michigan Ave. Chicago, Ill.
OMAHA RUBBER CO. Omaha, Neb.
H. F. BROWNELL CO. Sioux Falls, S. D.
HUGHSON & MERTON, 530 Golden Gate Ave. San Francisco, Cal.
Foreign Branch: HOLLEY BROS. CO., Coventry, England.

BRANCHES:

Los Angeles, Cal. Hughson & Merton, 1229 So. Olive St.
Portland, Ore. Hughson & Merton, 329 Ankeny St.
Seattle, Wash. Hughson & Merton, 924 East Pike St.

Holley Carburetors are carried in stock at the following addresses:
CHAS. E. MILLER, Home Office: 97-103 Reade St., and 121 Chambers St., New York.

BRANCHES:

New York City 924 Eighth Ave., between 54th and 55th Sts.
New York City 2782 Broadway, between 107th and 108th Sts.
Springfield, Mass. Bridge and Dwight Sts.
Hartford, Conn. 274 Trumbull St.
Atlanta, Ga. 66 Edgewood Ave.
Brooklyn, N. Y. 1421 Bedford Ave.
Buffalo, N. Y. 824 Main St.
Albany, N. Y. 135 Central Ave.
Boston, Mass. 202-204 Columbus Ave.
Detroit, Mich. 227-229 Jefferson Ave.
Cleveland, O. 1829 Euclid Ave.
Philadelphia, Pa. 318 No. Broad St.
New Orleans, La. 601-603 Baronne St.
Newark, N. J. 274 Halsey St.

Holley Brothers Company

Detroit,

Michigan

When Writing to Advertisers, Please Mention Motor Age.

FORD Quality Accessories



FORD Quantity Sales—

MR. FORD AGENT: We have elevated the Ford accessory trade by manufacturing only the salable Ford Motor Necessities and by producing goods of the highest quality. The result is that we have no dead carrying charges to saddle on the live merchandise and, consequently offer you the best values.

On this page there is space for only a few of our Ford specialties—no room to explain the fine points of design, workmanship and finish. Therefore, send for 1914 catalog and trade price list before you place any stock orders.

WARNING!

To Manufacturers, Jobbers, Dealers and Users of IMITATION Ford Anti-Rattling Ball Sockets.

Small concerns, of financially limited means, anxious to obtain a share of the business, undertook to "manufacture," in a crude way, duplicates of Anti-Rattling Ball Sockets covered by the Kirk and Towle patents.

These patents, until a short time ago, were controlled by parties who were not in close touch with the national situation and infringers went unmolested.

Upon assuming part ownership of the Kirk patent and obtaining license under the Towle patent, we notified all known offenders that they were infringers and many of them immediately ceased.

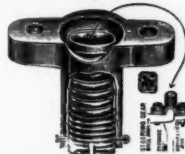


No. 400-S—\$1.00
Disc Adjustment for Radius Rod



No. 400-L—\$1.50
Screw Adjustment for Radius Rod

We are one of two owners of the Kirk patent No. 1,044,468, covering the construction of the above types of Ford Anti-Rattling Ball Sockets for Radius Rods. Beware of Radius Rod Anti-Rattling Ball Sockets of this design put out by others—they infringe.

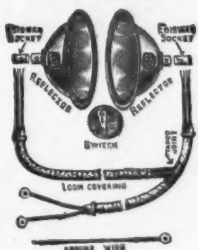


No. 400-G—\$1.00
Screw Adjustment for Connecting Rod

We are the only concerns licensed to manufacture under the Towle patent, January 13, 1911, covering the construction of Ford Anti-Rattling Ball Sockets for Steering Gear Connecting Rods. Beware of Steering Rod Anti-Rattling Ball Sockets not manufactured by us or the owner of the patent—they infringe.

There is no good business reason why you should handle an infringement and invite patent litigation, to say nothing of loss as a result of merchandise tied up by injunction. Protect yourself by looking for the "EVERLASTINGLY GOOD" trade-mark on the box. They embody the necessary spring construction and adjustment feature.

Electric Lighting Outfit, \$3



Covered with Loom
\$3.40 to \$3.60

Rear View Mirror (4-in. Reducing Lens)



Black, Brass, Nickel,
\$2.25

Rear Tire Holder



1 or 2 Tires, \$3.50

License Tag Holders

Front



No. 105-L—50c

Rear



No. 106-F—50c

Grease Cups



1/4 oz. .20c
1/2 oz. .25c
1 oz. .40c

Folding Robe Rail



Highest Quality Ford
Robe Rail on the
Market

Pedals



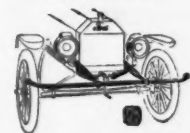
No. 50, Black,
30c

Complete Ignition Assembly



Timer and Plug Wires
Set, \$1.25

Clamp-on Bumper "Safety First"



Black, Brass, Nickel,
\$5 to \$7

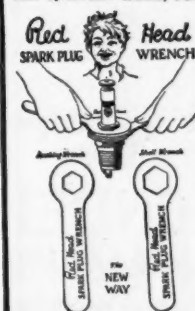
Oil Gauges



3 Types, 35c to 50c



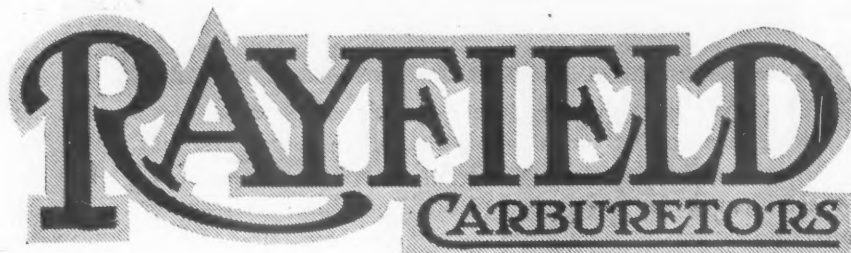
You have learned that calling a plug a "Ford Plug" does not make it one. The RED HEAD Long Body (1/4" Style B) is built for the Ford. The features:—Long Body above the threads takes care of the recess in the cylinder head, rendering the plug accessible with any wrench without danger of breaking the porcelain. Oil Drip Bend provides a flow for the oil, leaving the sparking points clean. Porcelain, petticoat type; guaranteed not to crack from the heat of the motor.



Wrenches free with every set of 4 RED HEAD Plugs.

One set of RED HEAD

Emil Grossman Mfg. Co., Inc.
Bush Terminal, Model Factory No. 20
Brooklyn (New York City) U. S. A.



24.4 Miles per Gallon by a Six

With all its adjustments, including that on the dash, soldered fast, a Rayfield Model G-3 stock carburetor, attached to a stock Chandler Six, last Thursday established a new high record for economy and wide range of efficiency.

The Rayfield Carburetor not only proved to be wonderfully economical but, without change in adjustment, also demonstrated itself to be powerful, speedy and exceedingly flexible.

The test was officially conducted by Mr. F. E. Edwards, chairman of the Chicago Automobile Club Technical Committee, and covered four separate performances calling for very different qualities in carburetor action.

What the Rayfield, Without Change in Adjustment, Did on the Chandler Six:

1. Ran 24.4 miles on one gallon of gasoline.
2. Showed speed of over 45 miles per hour.
3. Climbed Chicago's famous Hubbard's Hill, from a standing start, on high, and reached a speed of 20 miles per hour at the top.
4. Throttled down on high speed so low that for a stretch of several hundred feet the speedometer did not register.

Note.—Both carburetor and car were stock in every particular, not specially prepared for the test. The car carried full equipment, was occupied by four passengers and weighed 3700 pounds with load. Tires 34"x4". Temperature 52° at start, 56° at finish; actual specific gravity of fuel 60°.

If you want perfect carburetion you must use the Rayfield

FINDEISEN & KROPF MFG. CO.


2131 Rockwell Street

Chicago, Ill.

BRANCHES: 1140 Michigan Ave., Chicago. 1211 Woodward Ave., Detroit. 1902 Broadway, New York City

CHESTER DEMOUNTABLE RIMS

Make Fords
Better Cars



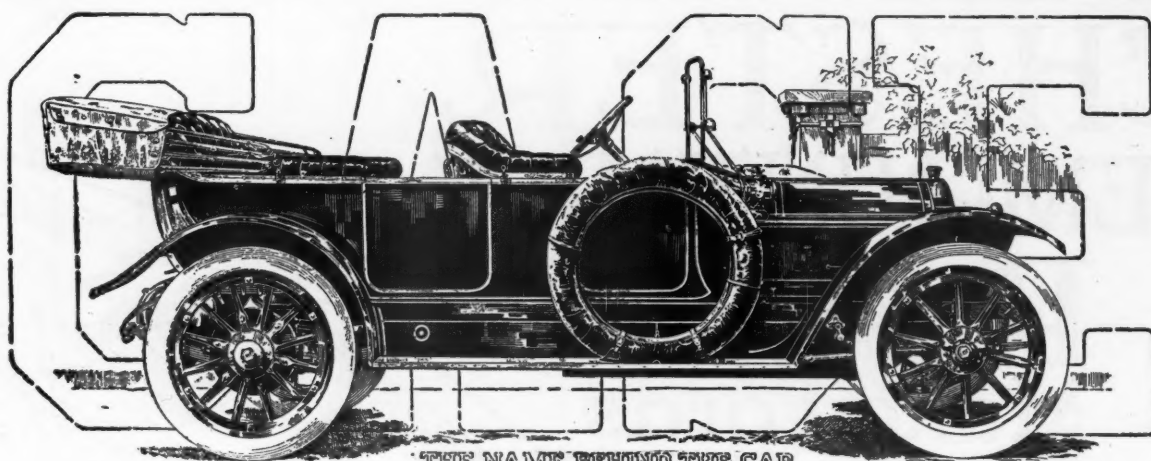
These rims are designed to give Ford owners the advantages of being able to use over-size tires on their cars without making alterations or going to unusual expense. To equip a Ford with a **Chester Demountable Rim**, it is not necessary to take the wheel off or to drill a single hole.

Five attachments on each wheel hold the Demountable Rim with its tire firmly and securely in place—all that is necessary is to screw up five nuts on each wheel the same as any other demountable is put on.

The reason why every Ford should be equipped with **Chester Demountable Rims** is found in the greater factor of safety, comfort and economy which over-size tires give. The price, \$25, includes five rims (one for spare) and attachments, complete, with socket wrench. No mechanical work necessary to make the improvement. Write us for particulars.

Chester Demountable Rim Co.
FALL RIVER,
MASS.

172 R



THE NAME BEHIND THE CAR

The Car You Will Buy

Which is it built to make—Customers or Sales?

Consider this issue—no matter what car you contemplate. For no car can remain that is built to make *sales*. And the Case is here to stay.

More Salable Cars Than Case

We have seen many. We could build them, too. They have wonderful surface indications, as oil men say. So has the Case, complete standard equipment (see specifications). But—

The car that remains must have deep-rooted merit—*hidden values*. The lesson most makers are learning now is as old as the name of Case. It has been our gospel for 72 years. It has made Case *customers* of the grandsons of our earliest patrons. Now they call ours "the car of *hidden values*."

And we build for the custom of the next generation as firmly as for yours.

Where We Save

After the Case is built we make our great saving! Seventy-nine branches, 500 traveling representatives, 9,000 dealers sell our *other* products.

An army was already employed and equipped; our market was waiting—then the Case Car was built. Now our unequalled organization handles the car as

an incident. No other maker's selling cost so low. Every year we save a fortune.

Were You Gain

We put this saving into the Case itself—into *hidden values*. It is spread through every car under the *hood and body*.

Yes, if we put it all in sight we might make our car more salable today. But we would make few customers tomorrow.

Our Catalog Tells You

Send for it. Learn car construction as told for the layman to understand. And see the Case. Have it demonstrated.

Then when you buy you avoid the costly price of experiment. Write us or call on the nearest Case dealer.

Case "25" \$1250—Case "35" \$1850—Case "40" \$2300

J. I. CASE T. M. COMPANY, Inc.

507 Liberty Street, Racine, Wis.

Case Cars are sold through 79 Branch Houses and 9000 dealers in United States, Canada, South America, Philippine Islands and Europe



CASE

The Car With the Famous Engine

Equipment of Case "40" Illustrated Above

Westinghouse Electric Starting and Lighting Equipment
Bosch Magneto (2-Point, Dual System)
Warner Auto-Meter
8-Day Clock (Rim-Wind)
2-Tone Electric Vibrator Horn
Firestone Universal Quick-Detachable Demountable Rims
Goodyear No-Rim-Cut Tires (37x4½)
Extra Tire on Rim
Two Extra Inner Tubes
Tire Cover
Weed Tire Chains
Rayfield Carburetor, water and air heated, Dash Adjustment
Genuine Fantasote Top and Dust Hood, Side Curtains, folded in top, easily adjusted from seats
Rain-Vision Ventilating Windshield
Electric Head Lights
Side Lights, Combination Oil and Electric
Electric Tail Light
Electric Dash Lamp
Work Light on Long Wire
Robe Rail, Foot Rest and the usual Tools, Tire Repair Kit, Jack, etc.
Mayo Impulse Tire Pump
Wheel Base, 124 inches
T-Head Motor (4½x5¼)
Forty Horsepower
Price \$2300 (including all the above equipment)

(253)

HIGH *and* LOW TENSION MAGNETOS



MASTER VIBRATORS ROAD SMOOTHERS AUTO LOCKS

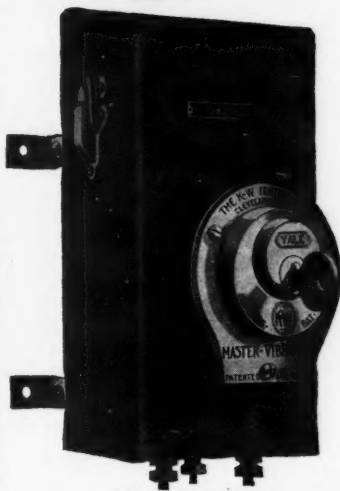
Right in Your Neighborhood



You will find a Ford Car Equipped with a

Master Vibrator

Ask the owner what it is doing for him every day



\$16 with K-W
Autolock Switch

You will find him enthusiastic about his K-W. He can tell you better than we of the economy, reliability and efficiency of the K-W Master Vibrator.

The K-W Master Vibrator contains a large, powerful condenser—proper capacity—and exceptionally large, solid platinum iridium contact points. A combination that insures a hot spark.

Over 90,000 Master Vibrator users have learned the value of this hot spark.

The K-W Master Vibrator gives:

Perfect Ignition—More Power—One adjustment instead of four—A hotter spark—Easier Starting—A smoother running engine—Less carbon deposits—Less gasoline used—Cleaner spark plug—No worry.

Don't Use Imitation Springs and Contact Points

K-W Master Vibrator owners are warned against the use of imitation springs and contact points on their Master Vibrators, as these positively will not work. For your protection all K-W points are put up in sealed envelopes, sealed with a label bearing our registered trade mark. Look for this K-W seal and the K-W Trade Mark that is stamped on the top of the "T" shaped bridge.

When replacing contacts use complete new springs. Do not solder new contacts to old springs, as solder destroys the contact and the spring itself will become bent and the cushion effect destroyed. The contact points on K-W Master Vibrators are large and are made of genuine platinum iridium, a material that costs three times as much as pure gold. Make sure you get the genuine with the K-W trade mark. Price \$3 per pair.

In buying your Master Vibrator be sure you get a K-W. Look for the K-W trade mark and the serial guarantee number. They protect you against imitations. If your dealer can't supply you we will send one direct, postpaid, on receipt of price.

Write for "That satisfied feeling Folder."



\$15 with Regular
Kick Switch

HEADLIGHTING OUTFITS

THE **K-W** IGNITION CO.
2835 CHESTER AVE. CLEVELAND, OHIO, U.S.A.

SPARK COILS SPARK PLUGS

It Is In Agreement With the Best Engineering Practice—

The DANN OIL CUSHION SPRING INSERT

"The Insert of 10,000 Oil Pockets"

Read What Automobile Authorities Say—

"Flexibility is a most important quality, as an insufficiently flexible spring makes a car hard riding."—Heldt, *The Gasoline Automobile*, p. 457.

"Their (the springs') flexibility must deaden the effect of jolts on the car and passengers. It is evident that preventing everything above them from having to jump at each jolt, springs decrease the loss of kinetic energy due to inequalities in the road."—Hasluek, *The Automobile*, p. 474.

Note that both Mr. Hasluek and Mr. Heldt lay stress on the word "flexibility." Spring flexibility prevents everything above the springs—car mechanism and passengers—from having to jump at each jolt. The truly flexible spring protects from vibration every bearing and joint in the power-plant, chassis and body. It prolongs car life.

Now, the only permanently flexible spring is a *Permanently lubricated* spring. No matter how perfectly a spring acts upon leaving the factory, it soon loses its flexibility—its jolt and shock absorbing qualities—if permitted to dry or rust. Guaranteed insurance against stiff, inflexible, vibration - conducting springs is found in DANN Insert, which provides *perfect spring lubrication* for from 2 to 3 years.

"It is necessary to keep spring leaves lubricated where they bear one against another. The common plan is to pry the leaves apart in some manner and introduce lubricant between them with a table knife."—Heldt, *The Gasoline Automobile*, p. 473.

It is impossible to lubricate a spring properly by prying its leaves apart. The bearing points—those points which most need lubrication—are often skipped and not lubricated at all; or, if they are lubricated, the lubricant quickly squeezes out, because the leaves bear *closely* on one another. There is nothing to *retain* the lubricant at these important bearing points. To keep these bearing points continually lubricated would necessitate the prying of a spring's leaves apart every few days.

DANN Insert contains about 40 lubricant-packed pockets to the square inch. Once inserted between the spring leaves, nothing can dislodge the lubricant from these pockets. The lubricant *can't* squeeze out—stays put *indefinitely*. DANN Insert insures every bearing point *permanent* lubrication, without the necessity of prying apart the spring leaves *once*.

"Modern car springs consist of finely tempered steel so formed and fastened together that they strengthen each other, while allowing free play for the natural spring of each plate or leaf to act, and by so doing to absorb a large portion of the vibration and jolting caused by the wheels passing over inequalities in the road. The various laminations must slide upon each other. In order to give the leaves the greater ease to slide upon each other it is necessary that they should be lubricated."—*The American Encyclopedia of the Automobile*, p. 1498-99.

"Free play" is the thing. New springs ride hard because their leaf surfaces, being rough and sand-papery, "catch" and hinder "free play." Most old springs ride hard because their dry and rusty spring leaf surfaces *prevent* "free play." Lack of "free play" between spring leaves causes springs to *conduct* car-killing vibration when they should *absorb* it.

DANN Insert interposes between spring leaves a perfectly and permanently lubricated bearing surface which is exceedingly "slidable." For that reason the leaves of a new spring equipped with DANN Insert can't "catch," but must "slide." DANN Insert allows "free play" from the very start.

Old springs equipped with DANN Insert never lose their "free play" because the permanent lubrication feature prevents them from "going dry," rusting, or "setting."

"A spring which has a comparatively large number of layers which are thin and not highly tempered will give a very much easier motion

than one which has fewer plates of greater thickness and of highly tempered steel."—Gunn, *The Practical Design of Motor Cars*, p. 246.

That is, the more leaves a spring has, the easier riding it is—the greater its shock absorbing qualities. DANN Insert is a thin perforated lubricant-packed strip of special shock-dampening metal. It is inserted from tip to tip between each spring leaf, thereby practically doubling the number of leaves the spring has. The easy riding movement of the spring is increased proportionately.

Write for free sample of Insert. Dealers wanted everywhere.



X-Ray view of spring equipped with DANN Insert, showing how the oil-packed strips of Insert are placed between spring leaves

FORD MOTORISTS! The Schaefer Sales Corporation, 1501 Arcadia Building, Detroit, Mich., is prepared to supply Ford owners with DANN Ford Insert—cut to proper lengths, neatly packed in a box, and ready for immediate installation between the spring leaves of any Ford car. Complete instructions accompany each order, making it an easy matter for you or your garageman to "Oil Cushionize" your Ford springs with the utmost despatch.

"Oil Cushionize Your Springs!"

Dann Oil Cushion Spring Insert Company
2252 Indiana Avenue, Chicago, Illinois

Put Dann Insert on Your Old Car—Demand It on Your New Car

Every Live
Dealer will find
it a benefit
to read
the Inter-State
Bulletin

Inter-State BULLETIN

Live News
for the Live Dealer
from
A
Live Red-Blooded
Organization

Volume 1.

MUNCIE, INDIANA, MAY 7, 1914

Number 1.

IMPORTANT ANNOUNCEMENT FOR LIVE DEALERS

MUNCIE CONCERN HAS ENTIRELY NEW ORGANIZATION

The present Interstate Motor Company has an entirely new organization composed of men who have for years been actively associated with the automobile trade. These men have been connected with a company which manufactures one of the most widely known automobiles sold today.

From president to factory foreman, they have achieved success by their ability to gain and keep the confidence of the public through honest purpose and straightforward methods.

Any dealer will find upon investigation that he can not represent a stronger or more reliable organization than the Interstate Motor Company.

This new factory organization means to reach out and organize the best dealers of every locality into America's greatest automobile institution. Will you take the time to investigate?

MANUFACTURING FACILITIES ARE UNSURPASSED

The Interstate plant as it stands today is, in equipment and arrangement, one of the most modern manufacturing institutions to be found in this country.

Engineers all over the country have pronounced it a model factory. The factory has ideal railroad facilities and is in the heart of the finest labor district to be found anywhere.

OWNERS

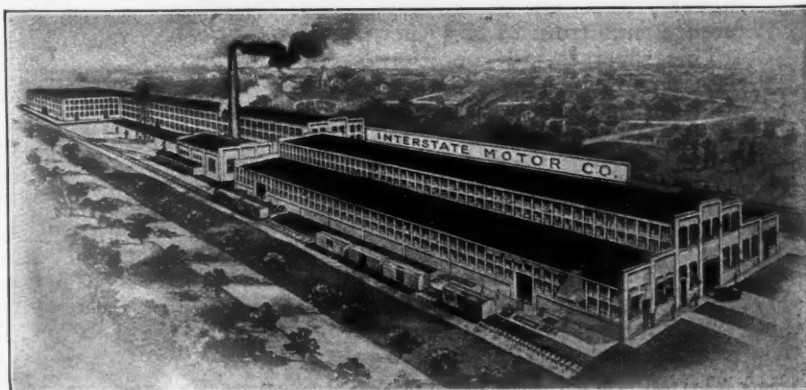
We have completed the rejuvenation of our service department, and can take care of any Interstate car regardless of age or the year of manufacture.

We want you to feel that we have a distinct moral interest in every car manufactured by our predecessors. We wish, through honest dealing and fair methods, to gain the good will of every Interstate owner.

If there is any advice or help we can give you, write us today, and we will gladly take care of your wants.

INTERSTATE MOTOR CO.
Muncie, Indiana

Inter-State Motor Co.



The Interstate Plant has 150,000 square feet of floor space and contains every mechanical equipment necessary to the building of high-grade automobiles. For seven years the former Interstate Company built splendid cars. There is an army of satisfied Interstate owners all over the country. We are maintaining the same quality construction.

AN EDITORIAL

By B. W. TWYMAN, General Manager

You will find that in every one of our bulletins in the future, we will have something of vast importance for every hustling dealer to investigate.

At present it will pay you to know the men back of this car, their financial responsibility, their experience and the facilities of this factory and organization.

Every live dealer should communicate with us and find out what we are doing now. It will pay you to associate yourself with a company that studies trade conditions. We are building and selling a car that will meet the public demand, and one that will make money for you and give the consumer the biggest value on the market.

Every dealer who has been to our factory has seen the wonderful value of our offer, and is not only obtaining immediate profits, but receiving the added value of having a connection with a company with a future proposition not to be overlooked.

We will have something to tell you in the near future that will be of vital importance, not only to the Interstate dealer, but to the entire trade. Don't fail to look for it.

B. W. Twyman

INVESTIGATION PROVES FINANCIAL STABILITY

The Interstate Motor Company not only has a wonderful organization and plant, but its financial condition is exceedingly good. The capital of this company is in the hands of men who have invested in it because they know that their money did not buy the Interstate material assets and good will with the idea of doing business full of "thunder" and "sky-rocket" policies.

The company has a distinct policy for present business—a good, honest proposition for next year—and unlimited money to carry out their plans.

The down-right proof of every factor in this proposition is yours for the asking. Investigate for yourself. Our books are open to the public.

You should write, wire, or better still, take the first train for Muncie and get our proposition first hand.

Watch for our next Bulletin.

We will tell you how by handling Interstate cars you can make trades profitably and at the same time give the purchaser the biggest value ever obtained.

Address all communications to the
INTERSTATE MOTOR CO.
Muncie, Indiana

Dent. G.



No-Rim-Cut Tires
Now 28% Less

We Are Forcing Down Your Cost Per Tire

A Goodyear No-Rim-Cut tire, size 34 x 4, costs \$28.50 now. And that with our double-thick All-Weather tread.

There are 16 makes of anti-skids sold at higher prices. On ten of those makes the difference runs from 25 to 47 per cent.

This reverses old conditions. No-Rim-Cut tires were once the high-priced tires. They used to cost you one-fifth more than other standard makes. Now comes the question if this low price means that other tires excel them.

Not in Quality

We have found no way to build better tires than No-Rim-Cut tires today. By that we mean, to give you lower cost per mile.

We have had scores of experts working years to improve them. We have spent \$100,000 yearly on research and experiment. We have built thousands of test tires in thousands of ways to find some way to lessen upkeep further. After all these efforts, all these comparisons, our opinion is that Goodyears offer the utmost in a tire.

Not in Features

RIM-CUTTING has been ended in No-Rim-Cut tires. And we control the only faultless method. Our statistics show that this one damage wrecks almost one old-type tire in three.

THE BLOW-OUTS due to wrinkled fabric have been wiped out by our "On-Air" cure. No-Rim-Cut tires are final-cured on air-filled fabric tubes. Thus the tire fabric adapts itself to actual road conditions. This extra process costs us \$1,500 daily, but it saves millions of dollars in blow-outs.

THE LOOSE TREAD danger is lessened 60 per cent by a patent method in No-Rim-Cut tires. Before vulcanization, hundreds of large rubber rivets are formed at the point where this trouble occurs.

AS AN ANTI-SKID our All-Weather tread excels in a dozen ways. It is tough, double-thick and enduring. In every direction it presents to wet roads a sharp-edged, resistless grip. Yet it is flat,

broad, regular; so it runs as smoothly as plain treads. All these great features—the greatest in Tiredom—are exclusive to No-Rim-Cut tires.

Not in Popularity

And no tire excels in popularity, which is the final test. Goodyear tires outsell any other. And now, after more than three million have been put to the test, the demand is growing faster than ever.

We are building now, to meet this demand, up to 10,000 motor tires a day. And the past four months show a sales increase of 55 per cent over last year.

Such is the verdict of users—of the hundreds of thousands who have used these tires on cars that meter mileage.

Prices Dropped 28%

The Goodyear prices of today are due to output, to efficiency and to modest profit. Prices have dropped, on these accounts, faster than rubber cost dropped. Last year's reductions totaled 28 per cent.

We have new factory buildings, new equipment. We have experts in efficiency. Overhead cost, since the days of small output, has dropped 24 per cent. Labor cost per tire has dropped 25 per cent. And our profits have been pared down, until last year they averaged 6½ per cent.

Cost per tire is the first great factor in your cost per mile. A skimpy tire at any price is costly. But you don't need to pay more than Goodyear prices to get the best men know in tires.

Could a higher price give you more real value we would give it to you. But our opinion—based on thousands of tests—is that Goodyear tires mark the present-day limit in low cost per mile.

Go to a Goodyear dealer next time you buy tires. Pay only Goodyear prices. Then compare the actual service with tires which cost you more. We will gladly abide by your verdict.



THE GOODYEAR TIRE & RUBBER COMPANY, AKRON, OHIO

Toronto, Canada

London, England

Mexico City, Mexico

Dealers Everywhere Branches and Agencies in 103 Principal Cities Write Us on Anything You Want in Rubber

(1522)

Mr. MOTORIST

Here's
a point
you may
have
missed



THE greatest power loss with which motorists contend is due to leaky, cheaply built spark plugs—compression leaks through or the charge is only partly ignited.

A cheap plug must be poor; a poor plug always causes power loss, over-heating and costly damage to engine and car.

BOSCH PLUGS

were designed so that the right plug could be had, so that power losses, overheating and other ignition troubles could be eliminated and so that the full power always could be obtained.

Bosch Plugs are right and act right. Proof of this fact is in the showing made by Bosch Products in the recent Vanderbilt Cup and Grand Prize Races. Both winners and EVERY car to finish used Bosch Plugs; also the Bosch Magneto. This was a gruelling test—more heat was present, more oil was used, and greater speed was evident than you ever would require—but Bosch Plugs stood it—because they are As Good as Bosch Magnetos.

Try a set on your car—the same kind of plugs as used by the racers—they knew.

\$1.00 each in U. S. from any dealer, or from Bosch Service Stations or direct.

"Locating the Spark Plug" tells what you ought to know about plugs—it's free.

Bosch Magneto Company, 214 W. 46th Street, New York, N. Y.

199 Service Stations in U. S. and Canada to serve you



Rich Tungsten Valves



Pat. Jan. 28, 1913.

Nearly 2,000,000 Sold

Every one was sold strictly on its merits—on its ability to withstand any degree of heat that any automobile engine will generate and do it without warping, pitting, leaking or ever having to be reground. Price never sold one of these valves. In fact, the price is higher than that charged for ordinary valves.

But we demonstrated time and again to motor-car builders that Rich Tungsten Valves save many times their cost in eliminating valve troubles—increasing the efficiency of the engine and reducing fuel bills.

The Northway Motor Company realizes these facts so thoroughly that they will spend \$150,000 more for Rich Tungsten Valves than their former valves cost them. The Chalmers Motor Car Co. will spend \$80,000 more. The Mitchell-Lewis Motor Co. will spend \$50,000 more, and so we might go on through the entire list at the right.

When these experienced manufacturers can see the advisability of such additional valve expenditures, other car builders and the buying public should readily see the "Handwriting on the Wall"—the dawn of a new, a better valve era. An era in which the annoyances and troubles of ordinary valves will no longer be tolerated.

Send for Interesting Booklet, Entitled "Reasons for Rich Tungsten Valves." Prices Gladly Quoted on Valves of Any Size and Any Quantity.

Rich Tool Co., 414 Railway Exchange Building, Chicago

Adopted As Standard Equipment in All These Leading Cars:

Pierce-Arrow
Chalmers
Lozier
Mitchell
White
Cole
Stutz
Mercer
Paterson
Oldsmobile
Cartercar
Oakland

Also Adopted by These Leading Engine Builders:

Northway Motor
Company
Wisconsin Motor
Company
Herschell-Spillman
Company
Dusenbury Motor
Company
International Motor
Company
Rudge-Whitworth
Company, Ltd.

Here is the greatest "Six" value in the world

Herff-Brooks "Six" at \$1375

THERE'S always been a demand for sixes; all automobile people know this; for a while the manufacturers tried to ignore this demand and advanced all sorts of arguments for fours as against sixes; naturally, as they were equipped to build fours, not sixes.

It's the old, old story—the public won.

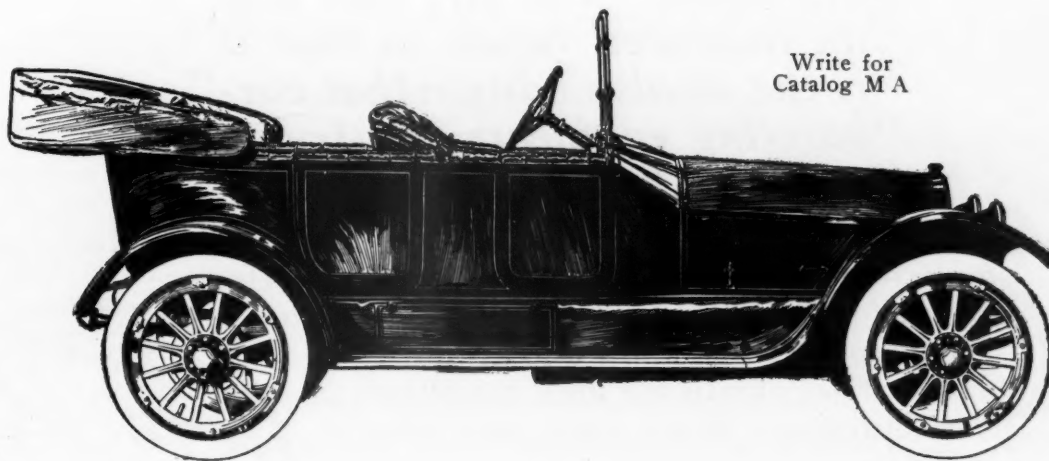
The supply of sixes started at about the \$6000 figure; again the demand came—

"Give us sixes at reasonable prices!"

Down, down, down, the prices came—\$3000—\$2375—\$1875—but this wasn't low enough; too much money for the popular demand.

Here's the final step, the maximum value, the greatest service, the truest equivalent for your money.

Look into this and you'll buy no other six at any price—Why should you?

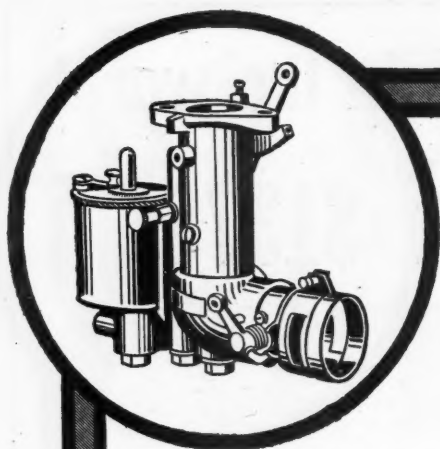


Write for
Catalog M A

**Here's What You Get
for \$1375**

48 H. P. six-cylinder motor, 4-inch bore and 4½-inch stroke, 124-inch wheel base, electric starter, lights and horn, ¾ elliptic springs in rear, ¾ floating axle, demountable rims with extra rim, center control, cone clutch, clear vision windshield, mo-
air top and curtains, speedometer.

HERFF-BROOKS CORPORATION
Indianapolis, Indiana



WHAT YOU HAVE IN THE **ZENITH**

THE WITNESS: "We have in the Zenith Device"
 "a very interesting compensating feature which"
 "applies not only to starting but to continuous"
 "running, and running under widely varying con-"
 "dition. This compensation, by employing one"
 "nozzle which varies mainly with suction, and the"
 "other nozzle, which varies in less degree with the"
 "suction, is one of the important points used in"
 "carburetors of today, in some carburetors. It"
 "accomplishes an automatic balancing as between"
 "a suction controlled nozzle and a restricted"
 "nozzle, or gravity-controlled nozzle, by which a"
 "practically uniform mixture is secured under all"
 "working conditions of the engine, whether run-"
 "ning very fast or very slow, whether running"
 "slow under a heavy load or slow under a light"
 "load, or heavy under a heavy load or under a"
 "light load."

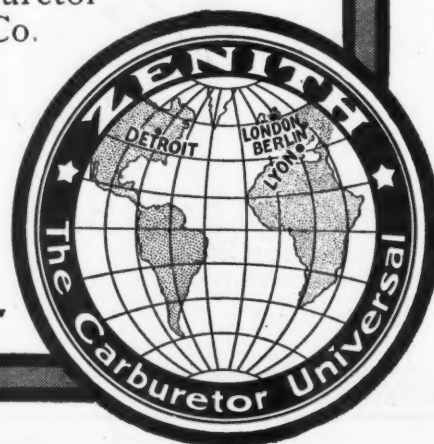
THE COURT: "*Was that an*"
 "*improved result?*"

ANSWER: "*Yes, sir; that was*"
 "*an improved result, in that it*"
 "*is the ideal condition that car-*"
 "*bureting engineers are trying*"
 "*to attain.*"

The above is an abstract from the testimony of the star expert witness not for the Zenith Carburetor Co. but for the Stromberg Motor Devices Co.

Our competitors know and acknowledge that we obtain the ideal condition in carburetion. Draw your own conclusions.

ZENITH CARBURETOR CO.
 DETROIT, MICHIGAN.





"The MENOMINEE" TRUCKS

FOR ECONOMY

Are Sold in Fleets, or One at a Time

The illustration represents a fleet of Model A-3 MENOMINEE Trucks recently sold by the Chester N. Weaver Company, of San Francisco, to the Pacific Telephone and Telegraph Company of that city.

No greater evidence of merit could be advanced than the fact that big public utility corporations throughout the country are purchasing MENOMINEE Trucks in fleets, while men in smaller lines of business are consistently buying them, one at a time. No line of business, large or small, now using horses, but can utilize to advantage a MENOMINEE—"The World's Lowest Upkeep Truck."

More MENOMINEE Trucks are in use today than any other make of car on the market of the same size and price. There are economy reasons! Write for them, as well as for information about MENOMINEE 1-Ton Trucks at \$1400 and 1½-Ton Trucks at \$1800.

SPECIFICATIONS MODEL A-3—1500 lbs. Capacity

Oiling System—Automatic and a combination of force and gravity feed.

Steering Gear—Adjustable worm and segment with 18-inch wheel. Steering column and wheel spider, black enameled.

Motor—25 H. P., 4-cylinder, 3¼-inch bore and 4½-inch stroke, fitted with governor.

Radiator—Vertical tube. Honeycomb front effect and black enameled.

Transmission—In unit with motor. Selective type, three speeds forward and one reverse. Nickel steel driving shaft.

Drive Shaft—

Maximum Speed—25 miles per hour.

Brakes—Internal and external with 14-inch drums on rear wheels.

Equipment—Two gas headlights and generator, two side oil lamps, one tail oil lamp, one horn (all of which are black enameled with nickel trimmings), one jack and full kit of tools.

Loading Space—Express body, 84x42 inches. Stake body, 84x60 inches.

Carrying Capacity—1,500 pounds.

Wheel Base—112 inches.

Wheels—32-inch. Artillery pattern, made of second growth hickory, 1½-inch spokes.

Tires—32x3½ inches, solid rubber or 34x4 Pneumatic.

Springs—Front, half elliptic, 2½x40 inches. Rear, platform, three-point suspension, 2½x42 inches.

Frame—3-inch heat treated channel steel.

Front Axle—I-Beam, 2½x1½ inches, drop forged.

Rear Axle—Full floating nickel steel live axle shafts.

Gear Ratio—4½ to 1.

Clutch—Tempered discs so arranged that a stream of oil is thrown on them at all times while motor is running.

Carburetor—Schebler.

Ignition—Magnet and batteries.

Control—Hand levers located in center of car.

Price Chassis Only, \$1125
Complete with Express or Stake Body, \$1200

DEALERS: The big demand this year has been for trucks of the MENOMINEE type. MENOMINEE prices are right—MENOMINEE Trucks are right—the concern back of them is right. These facts make 90% of the truck prospects in your territory MENOMINEE prospects. It is easier to sell MENOMINEE Trucks than to compete with them. Write for generous agency proposition.



D. F. Poyer Company, Menominee, Mich.





Making Friends For Firestone Rims and the Car That Carries Them

The time-saving convenience—the freedom from worry made possible by Firestone Rim Equipment is an advantage that counts quite as much for the car-manufacturer as for the owner.

It means car-protection, wheel-efficiency and universal service-satisfaction.

Firestone

Quick-Detachable Demountable RIMS

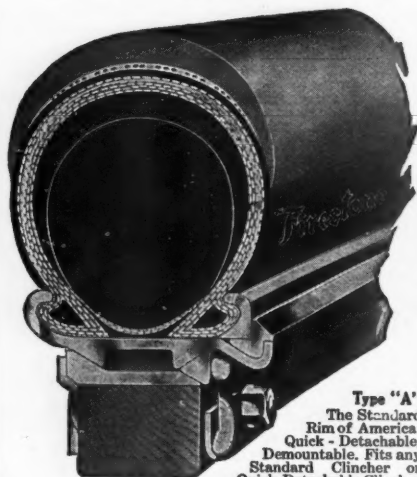
Ease of Handling is obtained by the simplicity of the Firestone design. No complicated "mechanics." Just six nuts to loosen.

Perfect Interchangeable System—all rim types, clincher or straight-side, fitting on the same felloe bands.

Strength with Lightness—emergency-proof, and yet free from bulk.

Continuous Wedge Ring protects the tread from wear and the inside of tire from moisture. It prevents all trouble common to "local wedges"—seats the tire true and guards against side strain.

Secure Locking Feature of the Firestone valve sleeve protects against the danger of "throwing" a tire when suddenly deflated.



Type "A"
The Standard
Rim of America.
Quick-Detachable,
Demountable. Fits any
Standard Clincher or
Quick-Detachable Clincher
Tire.

Firestone Rims are now, and have been for years, Standard Equipment on a long list of America's leading cars. And the list is growing fast.

Firestone Tire and Rubber Co.

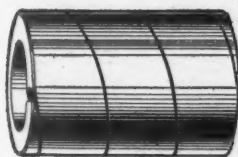
"America's Largest Exclusive
Tire and Rim Makers"

Akron, Ohio—All Large Cities

Pneumatic Tires, Truck Tires, Pleasure Electric Tires, Carriage Tires, Cycle Tires, Fire Apparatus Tires, Rims, Tire Accessories, etc.



Type "C"
America's
Leading Rim
for Straight-Side
Tires. Quick-Detachable, Demountable.
Fits any Straight-Side
Tire.



The Spiral Hyatt Roller

You probably have noticed the great similarity in outward appearance between the different makes of anti-friction bearings.

They all have outer and inner races made of hardened and ground steel, but the Hyatt is the only bearing that has hollow spiral rollers as the rotating element. Other types employ solid rollers, and some, balls.

This hollow spiral roller of the Hyatt Quiet Bearing is in a great measure responsible for the splendid service rendered by these bearings.

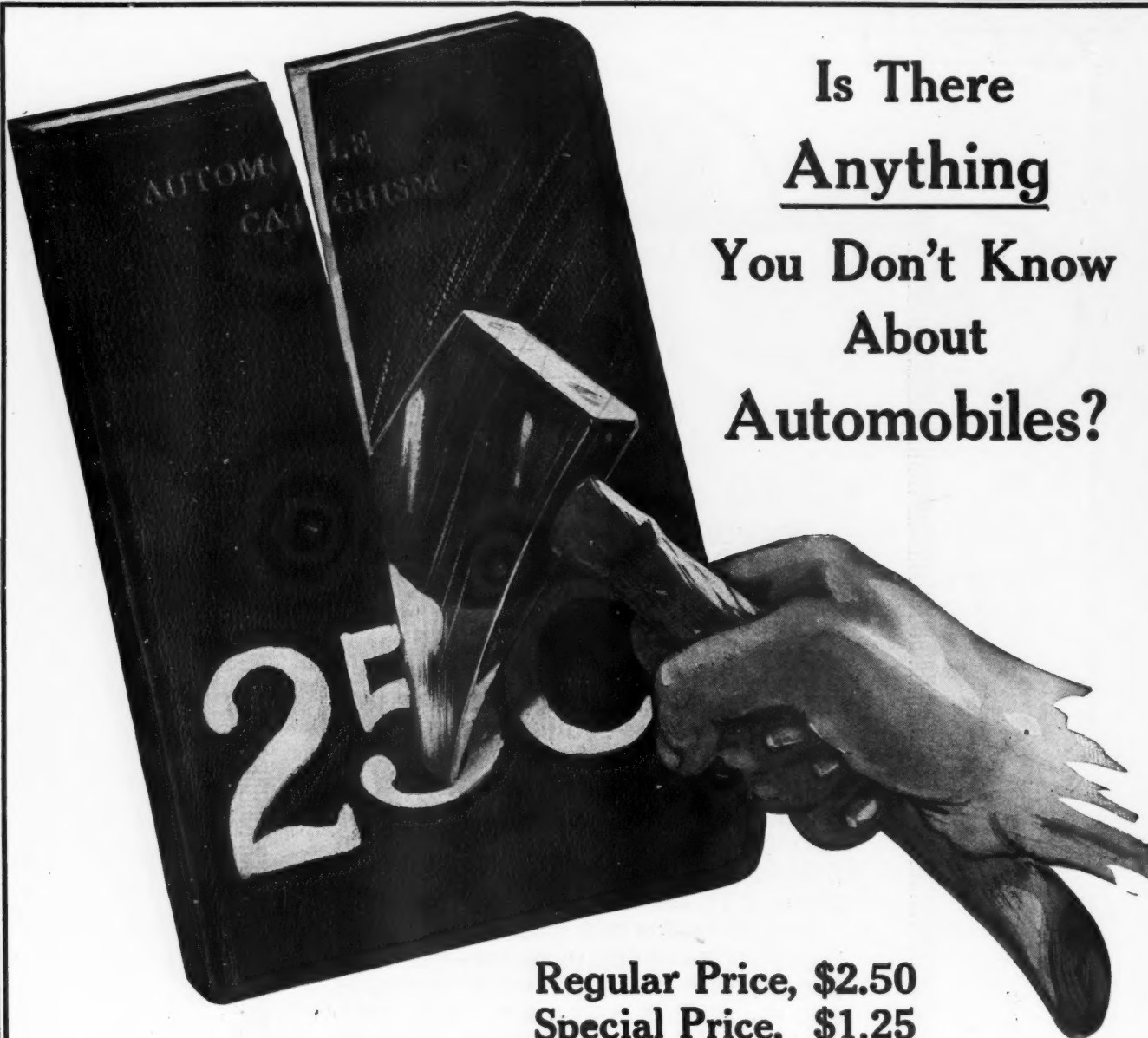
It cushions road shocks—absorbs vibrations—reducing noise—relieves the surrounding mechanism of undue strain, and is self-oiling and self-cleaning, because it forces dirt and grit through the spiral slots into the hollow center of the roller, keeping the surfaces exceptionally clean.

Two books, one about motor car bearings in general for prospective purchasers, the other for automobile owners, will be sent on request.

"Hyatt Quiet Bearings"

HYATT ROLLER BEARING Co.
DETROIT, CHICAGO
NEWARK, N.J.





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Anything
You Don't Know
About
Automobiles?

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Waltham Automobile Timepieces have chronometer accuracy

So dependable are the Waltham Automobile Timepieces that they can be consulted for the exact time just as the famous Waltham Chronometer is now consulted in jewelers' windows for setting pocket watches the world over.

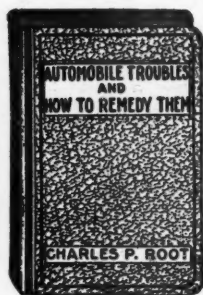
The time has passed when automobile owners were satisfied with any sort of adapted "clock" they chose, without regard to its fitness for automobile service. The demand is now for a *real* scientific timepiece, constructed to tell the *exact time* on all roads and in all weathers and temperatures.

The Waltham timepieces are the first to meet this demand. They are of chronometer construction, vastly strong, adjusted to all extremes of temperature, proof against the constant vibrations of motor car travel.

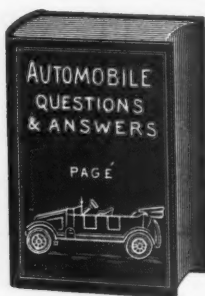
No other automobile timepiece can equal this high Waltham standard of precision and strength.

The popularity of the Waltham among motorists points the moral for the manufacturer. To make the timepiece class with the car, adopt the Waltham as standard equipment.

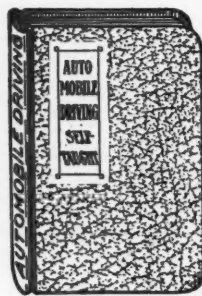
Waltham Watch Company, Waltham, Mass.



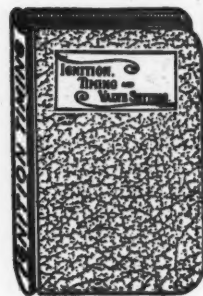
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QUESTIONS AND ANSWERS relating to automobile design, construction and repair, by Victor W. Page. A practical treatise consisting of a series of 36 lessons, covering some 2,000 questions and their answers. Subject matter is correct and explained in simple language. A feature of this book is the treatment of some of the most important motor ailments, their causes, effects and cure. Price (cloth) \$1.50.

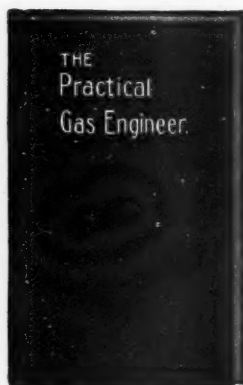
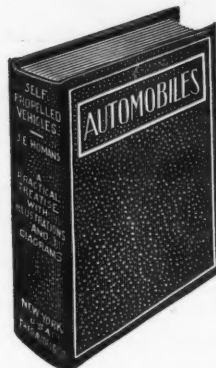


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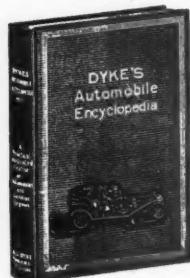


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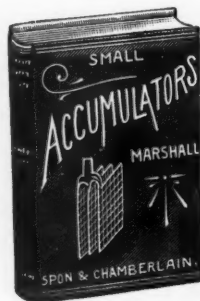
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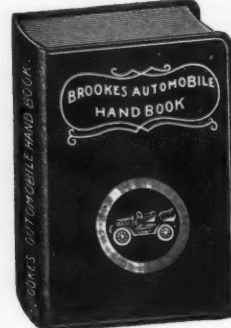
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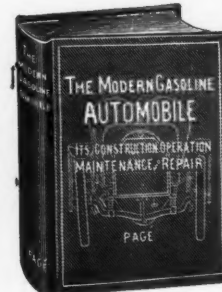
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THE AUTOMOBILE HANDBOOK. By L. Elliott Brookes. 700 pages and over 320 illustrations. New enlarged edition. Popular edition, full leather limp, \$2.00 postpaid. A work of practical information for the use of Owners, Operators and Automobile Mechanics.



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Wash your cars in one fifth the time

Keep your clothes dry, your feet dry, save your back, your temper, save four-fifths of your time—in a nutshell, that's the story of the WIZARD WASHER. No more need for old clothes, rubber boots, rubber aprons, lame backs and frazzled tempers. This device does away with the worst drudgery facing the auto owner—gets into every nook and corner where a sponge never reaches—a wonder for quick, thorough work absolutely without injury to your car's most delicate finish.

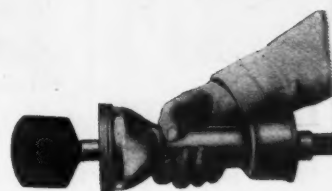
A wonderfully efficient, new principle

The WIZARD WASHER consists of a specially designed nozzle, a ball bearing turbine motor, a 14-inch extension and two interchangeable brushes—one long and pointed that gets into tight places and corners, the other shaped like a sponge for flat surfaces and general cleaning.

The nozzle throws a hollow film of water completely around the rapidly rotating

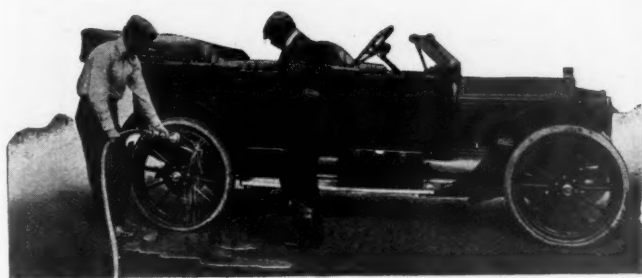
brush—this unique principle guarantees a layer of water always between the surface being cleaned and the brush. Absolutely no possibility of any harsh scratching effect. Even dry, hard mud disappears without harm—so easy and simple a woman or child could do it.

All parts of high-grade aluminum and brass with ball bearing turbine motor; fine quality of brushes; all very durable.



Reaches spots a sponge never could. Fast; Clean; Thorough; Harmless to finest finishes; Light Weight; Simple; Durable; Ball-bearing; Works five times as fast; Fits any hose; Inexpensive.

"A quick, clean job and a thorough one"



Free Descriptive Folder

Write for the whole story of this easy, quick, simple rotary Washer—send now for Folder and Prices.

CENTURY FOUNDRY COMPANY

1620 North Salina St.,

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DEALERS Send for trade discounts. A proposition that will sell it- GARAGES self to car owners.

Be Sure to Install a New York Coil Company's MODEL "T" or SENIOR MASTER VIBRATOR on Your Ford

It insures a smooth running and much more powerful engine, gives you but one adjustment instead of four, and greatly decreases carbon and spark plug troubles.

Our six years of master vibrator experience enables us to supply an instrument that is superior in design, material, workmanship and action to any existing type. They positively cannot stick or give the trouble usually experienced with other master vibrators.



MODEL "T"
Master Vibrator
Price \$10

New York Coil Company

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Price with Snap Switch \$12, with Kick Switch \$14, with Yale Lock Switch \$16.

Quality Is Economy

**Important Facts in
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For Motor Car and Carriage Bodies

I Facts for the Builder :

It brushes with remarkable ease and smoothness.

It has a peculiarly fine flowing and spreading quality.

It enables the Finisher to increase his daily output.

It is hard enough for the assembly room over night—to hang in 16 hours.

II Facts for the Salesman :

It has an elegance which greatly helps to sell. People are fascinated by its perfect surface and by its *depth* of luster and brilliancy.

III Facts for the Owner :

It has the *lasting* beauty which multiplies pride and divides re-painting bills.

The Varnish That Lasts Longest **Murphy Varnish Company** NEWARK, N. J.
FRANKLIN MURPHY, President
Associated with Dougall Varnish Company, Limited CHICAGO, ILLS.
Montreal, Canada



"Be Sure the Lamps You Buy Bear the Name Edison"

EDISON MAZDA Lamps are generally used on automobiles, motor trucks, trains, trolley cars, factories, offices, etc.

Considerable variation in these fields—nevertheless EDISON MAZDAS are used because they give the most efficient and satisfactory service everywhere.

EDISON MAZDA *Automobile Lamps*

are made in the same factories with the same knowledge, experience and detailed application that is given to the larger and more powerful units made by the largest manufacturer of incandescent lamps. EDISON MAZDA Automobile Lamps are constructed with thick strong filaments designed especially for the service.

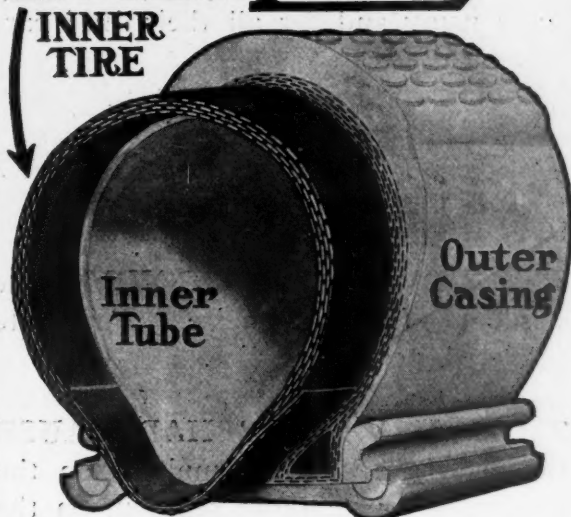
Because of this acknowledged experience in automobile lamp manufacture, nearly every engineer of cars and lighting systems has adopted EDISON MAZDAS as standard, and practically every car owner of today when replacing bulbs is insistent on EDISON MAZDAS—they are backed by MAZDA Service.

"Be sure the lamps you buy bear the name EDISON."

EDISON LAMP WORKS
OF GENERAL ELECTRIC COMPANY
General Sales Office Harrison, New Jersey.

4585

INTERLOCK



Pressure Lock Flaps Tire Expense reduced a half!

The great problem of tire upkeep and expense is at last solved by Interlocks. They stop once and for all the annoyances caused by tire troubles and effect the great saving on tires by actually giving double mileage.

No Blow-Outs—No Worries

The extra strength made possible by the use of Interlocks prevents punctures and blow-outs caused by weakened tire fabric. Interlocks increase the durability so that tires will give service until the rubber tread is completely worn out and save the big waste of tire and money. By doubling the fabric's strength they make the tire last twice as long.

What Interlocks Are:

The Interlock is a complete extra inside tire which is easily placed between the regular casing and the inner tube. It is made exactly like a tire, full round, endless, and with interlocking flaps that lock to the rim so that it cannot heat or chafe; and does not interfere with either speed or resilience. The construction of the Interlock makes it take the strain completely from the side and rim of the tire as well as the thread.

Guaranteed for Full Year

No matter what the reason, if you damage an Interlock, our Factory Guarantee Tag now insures a speedy and generous adjustment from the factory for a full year from date of purchase. Now that the definite tire mileage guarantee has been removed by tire manufacturers, Interlocks are doubly important this year in saving money for motorists.

Write for New Booklet

It explains fully just how Interlocks will save a big part of your tire expense, and also free you from the bother and worry of tire trouble. This booklet is full of new tire information. Please state what size tires you use.

TO DEALERS: You should handle Interlocks—over a quarter of a million are now in use. One dealer sold 250 in 1911; 2,500 in 1912; 4,750 in 1913. That tells the whole story, for nothing proves success like repeat orders. Write us promptly for information and NEW CATALOG.

Double Tire Fabric Co. 534 West 11th St. Auburn, Ind.



Would YOU Buy a TIRE PUMP

Guaranteed for

5 YEARS?

Here's the Pump

-The Bell

NOTE these features:



The BELL
Connection
Clamp.

The BELL
Expanding
Plunger.

Heavy gauge
brass pump
barrel.

Plunger rod,
3/8 in. steel.

No wearing
parts.



The BELL
is all the Tire
Pump you
need—it does
the work to
your satisfac-
tion—and
costs only **\$4**

(via Parcel Post)

Bell Pump Company

74-78 Fort St., Detroit, Mich.

N. B.—The BELL
OIL GUN em-
bodies the ex-
clusive fea-
tures of the
Tire Pump
and sells
for

\$1.25

M. A.

BELL PUMP CO.
74-78 Fort Street, E.
Detroit, Mich.

Gentlemen:—

Enclosed please find \$4.00 for one
Bell Tire Pump, furnished under
your 5-year guarantee.

Name

Address



Safety Radius Rod and Front Axle Support for FORD CARS

For Better Steering—A Safer, More Rigid Front Axle—Insurance Against a Bent or Broken Radius Rod—Relief from Strain on the Crank Case.

These are all advantages you get by equipping your Ford with a Safety Radius Rod. It is the only device of its kind on the market which securely braces the Ford Axle to the frame.

This device consists of a radius rod fastened directly to the frame and on the spring bolt under the front axle. It not only makes the car safer and steer better, but it also relieves the crank case from all road shock. It is put on in such a manner that the regular Ford radius rod is relieved from all strain. If desired, the regular Ford radius rod may be entirely removed.

The rivets holding the crank case hangers on your crank case soon become loose, causing the oil to leak out, due to a continual road jar and shock on the crank case. The Safety Radius Rod and Front Axle Support relieves this strain and shock. It makes the Ford car steer better and also makes its front axle more rigid and therefore more safe.

The Safety Radius Rod and Front Axle Support is made of one-inch steel tubing with a three-sixteenth inch wall. The hinge joint or clevis, and also the flat fastening to axle, are drop forgings. It is simple and durable. Anyone can attach it within an hour. It eliminates all danger of breaking or bending the Ford radius rod and prevents wheels from locking when making short turns. It makes the Ford a safer and better car.

Guaranteed satisfactory or money refunded. Write for further information.

Order Through Your Dealer or Direct
Dealers Wanted Everywhere

MONNICH & ROGERS, Hooper, Nebraska

ONE YEAR AGO The Hudson Motor Car Co., gave up the top material they were using and for all their 1914 cars standardized

genuine **Pantasote** top material

slightly increasing the cost per car.

RESULTS HAVE PROVED the wisdom of their choice. Pantasote rendered perfect service.

THEY HAVE NOT HAD CAUSE to send us a single complaint on the Pantasote top material sent out on the thousands of Hudson 1914 cars delivered.

THIS RECORD SPEAKS FOR ITSELF and explains why the Hudson Motor Car Co., has just contracted for genuine Pantasote to be used as the exclusive top material on all 1915 Hudson Cars.

THIS REMARKABLE SERVICE was not due to luck or any favorable conditions. We can give the names of a number of other makers which have had similar experiences. For instance:

THE PIERCE - ARROW MOTOR CAR CO., used Pantasote top material exclusively for over ten years past without cause for complaint.



CAUTION—In purchasing an automobile top look for this label. It's your safest protection. There are cheap surface coated top materials which look like PANTASOTE (but only when they are new). Substitution is frequently practiced by unscrupulous dealers to increase their profits at the purchaser's expense. Labels like this are sent out free with every shipment of PANTASOTE. The top maker has no excuse for not using them on PANTASOTE tops.

"WHAT'S WHAT IN TOP MATERIALS," an interesting booklet, rips open and dissects all kinds of top material, Pantasote included. It will be sent without charge on receipt of your address.

THE PANTASOTE CO.
85 Bowling Green Bldg., New York City

\$10

Complete
With
Gauge

FOR FORD CARS—For Any Car

MAYO SPARK PLUG PUMPLowest-Priced Complete FULL GROWN
Power Pump Obtainable

Not a miniature pump in any sense. It will inflate a Ford tire quicker than any other Ford power pump on the market. Built like a motor and will last as long. Pumps nothing but pure, cool air.
Complete with gauge, 12 ft. quality hose, and all connections—

Price \$10.00

Mayo Quick Detachable Spark Plug \$1.50 Extra
You may try this pump free on your car for 30 days.
Write us.

Mayo Manufacturing Co. 55 E. 18th St.
Chicago, Ill.



The cap at the base of the absorber adjusts the tension of the tapered helical spring. This adjustment feature of the

Coxajusto
ADJUSTABLE TO ANY LOAD

Shock Absorber

is the reason for its superiority. It's head and shoulders above all others. Coxajusto will pay for itself many times over in comfort and saving in repair bills. It absolutely absorbs the shock.

Heavy Car Type, \$25 to \$35 a Pair

Send for Folder today Address Dept. A

COX BRASS MFG. COMPANY

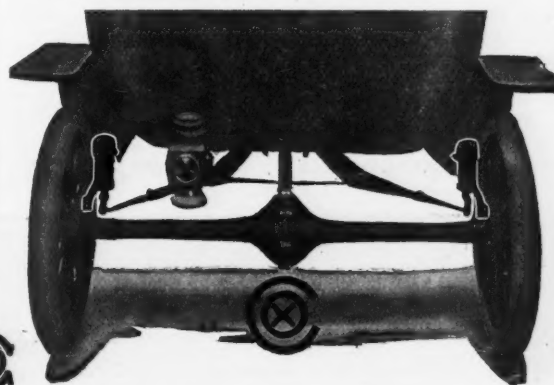
Established 1872

ALBANY, N. Y.

1777 Broadway New York City
2637 Michigan Ave. Chicago, Ill.
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Export Representative

Auto Supplies Export Co. 1779 B'way, New York City

Special Ford Model, \$10 a Pair

At Last!



*The
horn
that
will*

*sell like
THE DEVIL*

Listen for the Friendly Warning--

You'll soon hear it from the car of every gentleman—not a raucous shriek but a piercing, far-reaching musical chord at the slightest pressure—either foot or hand control.

The biggest opportunity in the entire accessory field today for live hustlers—for men who can get action from the word go on a proposition that means big profits.

LAST CALL FOR TERRITORY RIGHTS

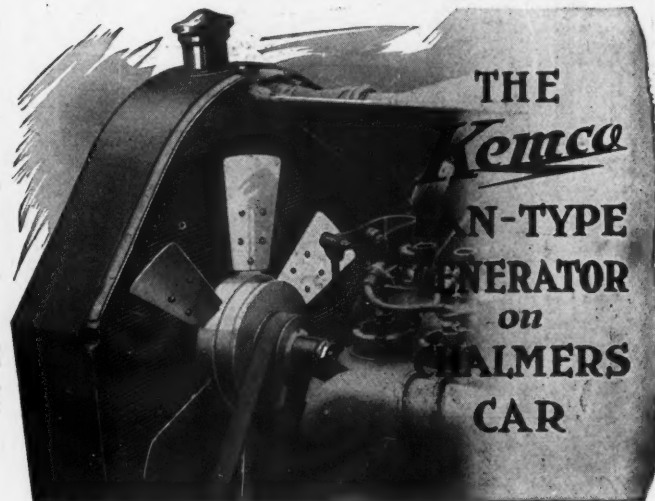
Right now—first crack off the bat, you've the chance to snap up the selling privilege for your own locality before someone else gets in ahead. Bound to be a big seller everywhere—simple, inexpensive, mechanically perfect, no up-keep cost, no trouble with couplings. Priced \$5, \$6 and \$7, according to power of car. Within the means of every car owner.

Ask About Our Distributors' Agreement No Deposit Required

The simplest, fairest proposition ever put before the trade. All you need to do is pay for the horns as you get them. WRITE NOW—before your competitor gets in touch with us.

Standard Motor Parts Mfg. Co.
Room 503, 1200 Chestnut St. PHILADELPHIA, PA.

Red Devil Horns



You Can Electrify Your Car

EASILY, quickly and at little expense, by merely replacing your fan with a KEMCO Fan-Type Generator. No need to tear down your car. One hour's work with a wrench—and you have a dependable source of current supply that enables you to enjoy the electrical conveniences found on the most up-to-date cars.

FAN- *Kemco* TYPE ELECTRIC GENERATOR

The KEMCO cools your engine under all conditions and fully charges your battery—keeps it in top-notch condition, alive for any emergency.

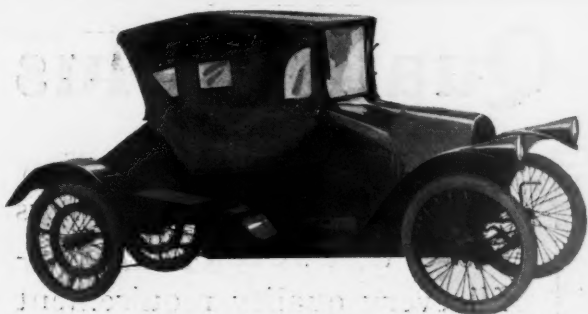
The KEMCO is the most compact and simple generator on the market, costs least to install, weighs the least, gives the greatest output per pound weight. Requires very little more power than the fan it replaces.

It's the one logical electrical generator for cars in service, and thousands of KEMCOS in successful operation on cars of all sizes and prices prove it absolutely practical—both electrically and mechanically.

Put a KEMCO on your car and know how it feels to have a SURE and ample supply of current always at your command.

The Kemco Electric Mfg. Co.
2233 Ashland Road Cleveland, Ohio

(46)



A fine outfit for a physician or any professional man

A great rain or shine car

"Saginaw" Cyclecar, \$395

By these signs you will know it

The beautiful lines of a high-grade automobile.

Sociable, side-by-side seating.

Special engine designed and built by us, not a motorcycle engine.

Generous wheel-base, 100½ inches.

Regular automobile road clearance.

50 miles per gallon of gasoline.

50 miles per hour, if wanted.

All the riding comfort of a \$5000.00 car.

Complete equipment—nothing more to buy.

Two Parabolic Head Lights with dimming attachment, top and storm curtains, windshield, 29x2¾ non-skid tires, electric horn, passenger foot rail, full kit of tools, tire pump, repair outfit, 90 ampere hour storage battery, Stewart-Warner speedometer.

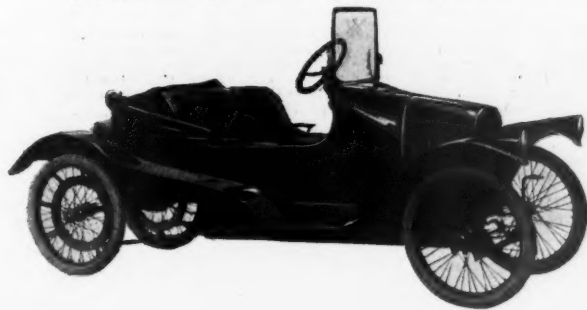
The "Saginaw" has been thoroughly tested under summer and winter conditions.

Remember that an old manufacturing organization builds it.

WE ARE NOW MAKING DELIVERIES

SOME OPEN TERRITORY LEFT FOR LIVE AGENTS

Valley Boat and Engine Co.
Saginaw, South Side, Michigan



IF

Your Automobile
is equipped with a

Pyrene
FIRE EXTINGUISHER

**You Can Secure
15% Reduction**

In Your Fire Insurance Premiums

Pretty convincing evidence as to the efficiency of Pyrene on motor car fires, isn't it?

"Safety first" is a popular slogan just now, and rightly so. The manufacturers are doing their best to make their cars fireproof, but the low grade fuel we are getting these days makes the fire-hazard of ever increasing importance.

But fire is not feared when your car carries a Pyrene Fire Extinguisher, the most efficient gasoline fire fighter modern science has yet produced. Hundreds of cars have been saved from total destruction by this powerful agent of conservation. That's why insurance rates have been reduced on Pyrene-equipped cars. This saving on your insurance premium alone will, in many cases, more than pay for Pyrene during the first year and in addition you get that feeling of perfect security—safety.

Better look into this matter right now while it is on your mind. The coupon below will bring you full information.

And when buying that new car do not forget the satisfaction which goes with the consciousness of safety—and ask that it be equipped with Pyrene.

The Aetna Accident and Liability Co. and the Automobile Insurance Co. of Hartford, Conn., allow this reduction—See their agents or consult your own broker.

At all first-class auto supply dealers

Brass and Nickel-plated Pyrene Fire Extinguishers are the only one-quart fire extinguishers included in the lists of Approved Fire Appliances issued by the National Board of Fire Underwriters.

Pyrene Manufacturing Co., 1358 Broadway, New York

Alton	Dayton	Philadelphia
Anderson, S. C.	Denver	Phoenix
Atlanta	Detroit	Pittsburgh
Baltimore	Duluth	Richmond
Birmingham	Jacksonville	St. Louis
Bridgeport	Louisville	St. Paul
Boston	Memphis	Salt Lake City
Buffalo	Milwaukee	San Antonio
Chicago	New Orleans	York, Neb.
Cincinnati	Norfolk	
Cleveland	Oklahoma City	

Pacific Coast Distributors:
Gorham Fire Apparatus Co.

San Francisco Los Angeles Seattle

Distributors for Great Britain

and the Continent:
The Pyrene Co., Ltd., 19-21
Great Queen St., London, W. C.

(Send this
Coupon to
nearest office)

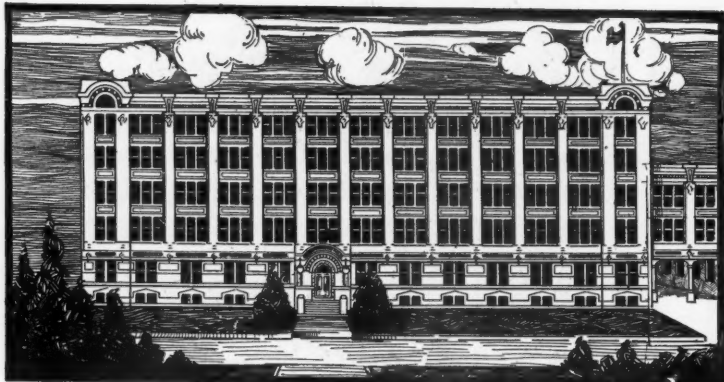
Mail me full particulars about Pyrene and reduction in cost of insurance.

Name

Street No.

City State

New Departure Quality, Plus



Daily output—10,000 guaranteed, insistently inspected, persistently tested ball bearings. *Quality first.*

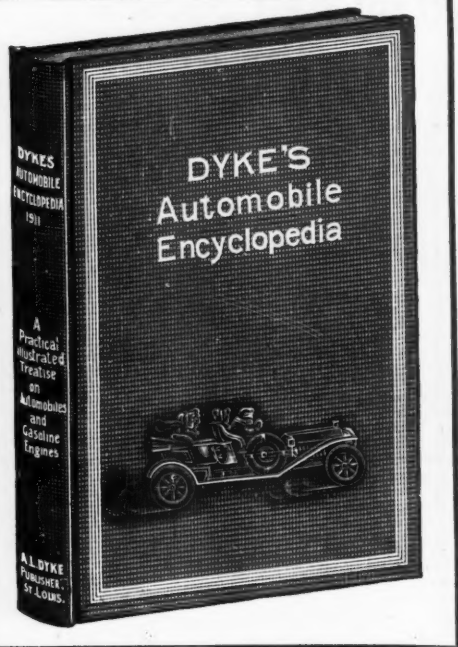
ball bearing manufactory in the world—a factory of ample capacity for quickly turning out bearings in large quantities. This should be an important consideration. Contract with us for requirements, and by doing so avoid serious delays that hold you up.

The New Departure Manufacturing Company, Bristol, Conn.

Western Branch, 1016-17 Ford Building, Detroit, Michigan

ACTUAL service of New Departure bearings proves that we can and do fulfill every quality requirement of the American car manufacturer, plus unfailing delivery when wanted.

New Departure bearings are made at home in the largest



Price Three Dollars postage prepaid

Address Book Department
CLASS JOURNAL COMPANY
910 So. Michigan Avenue, CHICAGO, ILL.

Dyke's Automobile Encyclopedia

is a simple, practical book written by A. L. Dyke, publisher of the first practical

treatise on automobiles in America. This revised and enlarged Edition is especially prepared for those who want to learn the principle and construction of all parts

of all cars, thereby enabling one to make repairs and adjustments in an intelligent manner.

This book explains the principle and construction of different ignition, carburetion, cooling and lubricating systems, together with the different types of engines and their valve systems; how to set valves, time the ignition, etc.

THE DIGEST OF TROUBLES is very complete—by turning to the index the CAUSE and REMEDY of the trouble is given.

THE ADJUSTMENT AND REPAIR SUBJECT is probably the most interesting. The subject of repairing begins with cleaning a car; cleaning carbon, chemically and mechanically; grinding valves; testing compression; taking up lost motion in valve stems and plungers; setting valves and timing the ignition; how to set all leading magnetos; scraping bearings; how to test for knocks and how to locate them; meshing the timing gears; fitting piston rings; carburetor repairs and adjustments; rewiring a car; ignition troubles and remedies; timer troubles and remedies; cooling troubles; how to clean and repair radiators; how to take up wear in differential; how to adjust the steering device; how to treat the clutch; lining up wheels, etc.

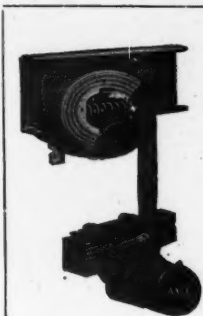
OTHER SUBJECTS—such as Building a Garage for Home or Business; Equipment of a Shop; Tires; Tire Repairs; Vulcanizing; Lighting a Car; Self-Starters; the Assembly of a Car; Transmission; Axles; Brakes; Differentials; Laws; Insurance; Metric Measurements Connected with English Measurements; Care of a Car.

ANOTHER FEATURE OF THE BOOK is the building-up process of a car, from the axles to the body; each part is added by means of progressive charts: First the springs are mounted on the axles, then the frame, then the power plant is mounted on the frame and each and every part is added until the car is completed. In this manner the reader learns the relation of one part to the other. The engine and transmission are assembled in the same manner.

THIS BOOK IS DIFFERENT. The matter is arranged in the form of instructions, of which there are 40. The type is clear. There are over 1000 illustrations, in the form of large, clear charts, of which there are 289. The reading matter is so clearly worded, a ten-year-old boy can understand.

1914 EDITION NOW READY, with 36 pages, 107 illustrations and 118 questions on the principle, construction and care of Electric Starting, Generating and Lighting Systems.

The Snubber Principle Is Entirely Different from that of any other shock-preventing device



When springs compress, the slack belting is drawn into the coil. When springs commence to expand the alternate layers of belting and brass friction band tighten up in proportion to severity of rebound. This friction is what retards the up-movement.

GABRIEL SNUBBERS

\$15, \$20, \$25, per set of Four.
Two front, two rear. Half that per pair.

The above small type shows how Snubbers "take hold" to prevent jolts and jars when the going is rough, but do not interfere with full spring resiliency on smoother roads. Also why they make your car ride as easily with ONE occupant as with SEVERAL.

Standard Equipment on the Easiest-Riding Cars—

White, Peerless, Stearns, Oldsmobile and Lozier. Partial or special equipment on more than twenty other leaders. All leading Automobile Engineers have tested them out and know their merits.—ASK THE ENGINEERING DEPARTMENT OF YOUR CAR.

Snubbers are even more necessary on smaller cars because of the abrupt and snappy rebound that goes with short wheelbase and less expensive springs.

Tell us name and model of your car and let us send booklet and prices.

Gabriel Horn Mfg. Co. 1415 E. 40th St., Cleveland, Ohio



Sheldon

WORM DRIVES

Superior engineering, best materials and reliable workmanship make SHELDON the greatest American-made AXLES and SPRINGS.

THE SHELDON WORM-DRIVE AXLE is recognized throughout the entire automobile industry as a superior product, sold at a superior price, to those who are willing to pay for what is absolutely best.

SHELDON AXLE CO.
Wilkes-Barre, Penna.

Chicago Peoples Gas Bldg. 122 S. Michigan Blvd.	San Francisco 444 Market St.	Detroit 1215 Woodward Ave.
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PEERLESS AUTOMOBILE SPECIALTIES

PEERLESS MOHAIR TOP DRESSING—Will waterproof without stiffening, and make an old mohair top look like new.

PEERLESS LEATHER TOP DRESSING—Made with oil to soften leather, rubber and pantasote tops.

PEERLESS LINING DYE—Covers all stains, making a uniform black lining that will not wash off.

PEERLESS CUSHION DRESSING—Will not wash off, or soil light clothes. Dries in twenty minutes.

PEERLESS LAMP ENAMEL—Made to cover solid one coat in both gloss and dull finishes. Will stay on the metal.

PEERLESS JET BLACK FENDER JAPAN—A deep, rich, mirror-like finish. Air drying. Wears indefinitely.

PEERLESS CYLINDER ENAMEL—Saves your engine parts from rust. Not injured by gasoline or grease.

PEERLESS AUTO BODY POLISH—A helpful varnish food that dries without a greasy surface. The results are lasting.

PEERLESS EXTRA FINE BLACK JAPAN—Especially recommended for all around work on metal and wood parts for a rich gloss finish.

PEERLESS EXTRA FINE BLACK BAKING JAPAN—For baking on metal parts where one coat gives perfect results.

Ask your garage, dealer or jobber for these products. If he does not have them, send direct.

Manufactured only by

THE COLUMBUS VARNISH COMPANY
COLUMBUS, OHIO



Gibson Quality Service

Mr. Dealer—you are in business to serve your customers more satisfactorily than your competitors. In order for you to accomplish this, you need our co-operation.

The Gibson Automobile Company is one of the largest and most complete automobile accessory houses in the world, and are equipped so that they offer you service as YOU would have it. We have built our reputation on Quality—Service and Fair Treatment. The fact that we now serve over 6,000 dealers throughout America is proof of our conscientious dealings, and of our ability to help YOU.

Have you received your copy of our complete catalog?

GIBSON AUTOMOBILE COMPANY

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Every Automobile and Garage Owner or Operator

should possess a reliable, durable, convenient Electrical Measuring Instrument



WESTON MODEL 280
Portable Testing Instrument

Weston Miniature Precision Ammeters and Voltmeters

FIT THE POCKET

and are in every way the most accurate, durable, reliable and altogether satisfactory for testing batteries and electrical circuits

Send for 30-page bulletin No. 8 describing these and other small instruments.

Weston Electrical Instrument Co.
NEWARK, N. J.

New York	Boston	Denver	Birmingham	Paris
Philadelphia	San Francisco	Cleveland	Toronto	Montreal
Chicago	St. Louis	Detroit	London	Berlin

Don't let the carbon accumulate in your cylinders until they require the drastic DOLLAR-A-CYLINDER treatment.

Clean them every two or three weeks with CARBONOX. Costs less than 5 cents a cylinder. Keeps them as bright inside as a new dollar.



A dollar's worth will remove the carbon from one cylinder twenty times. The cost is so low, the job is so easy, there's no temptation to put it off. It beats the strenuous, expensive way, even as a bath beats powder and perfume or as fresh air, exercise and prunes beat strong physics.

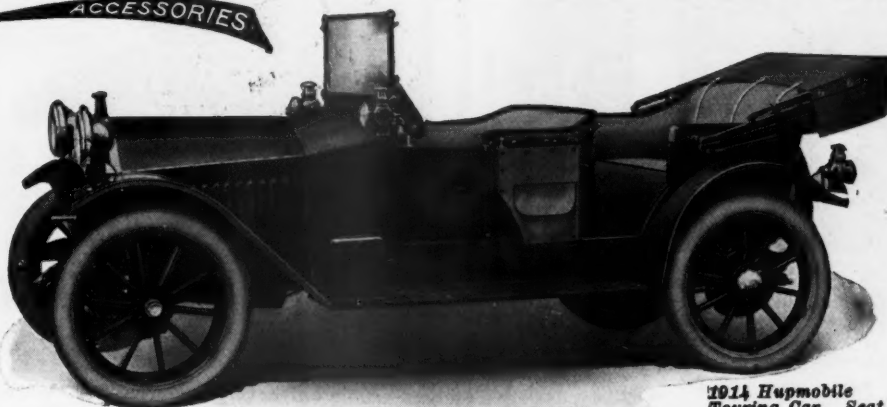
You inject Carbonox, a liquid, at the spark plug openings, or thru the priming cups, turn the engine over a few times and then let set for twenty minutes. When you start it, the carbon will be blown out thru the exhaust. A sheet of paper placed under the exhaust opening will show the amount of carbon removed.

CARBONOX does not dissolve the carbon, but attacks and destroys the charred oil which holds the flakes of carbon together and to the metal. It's simple, efficient, 'Chemically Correct'. Positively non-injurious to metal.

Made by the makers of SEWENTOL, the self-acting radiator cement. (Tint the light and fix it.)

THE NORTHWESTERN CHEMICAL CO.
MARIETTA, OHIO.

Nothing improves the looks of a car like "CAMPBELL" Water-Proof Seat Covers



1914 Hupmobile
Touring Car. Seat
and Door Covers, \$25

Get the
Campbell
Agency
for Your
Town

Stock sizes in Campbell Seat Covers for immediate shipment to fit the following cars:

1. Ford Roadster and Touring Car. 1910-11-12-13-14.
 2. Buick Touring Cars and Roadsters. 1913-1914.
 3. Cadillac—All Bodies 1914.
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 5. Hupmobile—32. 1912-13-14.
 6. Maxwell—all models 1914.
 7. Overland—all models 1913-14.
 8. Reo—1913-14.
 9. Studebaker—all models 1911-12-13-14.
- We can supply on short notice seat covers for practically any car built since 1910.

Campbell Seat Covers make old cars look new, save the upholstery on new cars. Clean, cool, comfortable. Easily removed and cleaned. Guaranteed water-proof. Nothing but high-grade materials used. Three grades—Waterproof Jeans, Mohair, Clean-ezy. Write for prices and samples.

The Perkins-Campbell Co.
624 Broadway, Cincinnati, Ohio



Campbell "Latigo" Ford Fan Belt made of special leather which is impervious to heat, water and oil. Strongest leather known to the trade. Will not stretch, slip or run off the pulley. List price, 50c.

Engineers Say This Piston Ring Is Mechanically Perfect



PATENTED

The latest improved piston ring on the market. Made in 3 pieces. All joints automatically sealed when the ring is placed on the piston. Adapted to automobiles, motor boats, steam engines, air compressors, etc.

STA-TITE Perfect Compression Piston Rings make new cars run better, and old cars run like new. With STA-TITE Rings on your motor you get perfect compression. That means full horsepower transmitted to the drive shaft.

The high cost of fuel is of vital importance to every motorist. With STA-TITE Piston Rings you get more power, more mileage per gallon of gasoline, and consume less oil, which means less carbon and less friction in the cylinders. These rings are made of special process gray iron, softer than the cylinder, and constructed so that leakage of gas through the rings is almost a mechanical impossibility. To attach no alterations are needed on the piston. Rings are made to fill the groove completely.

Satisfaction Guaranteed or Money Refunded

Liberal terms to supply houses and repair shops.

Write for Literature

STA-TITE PACKING RING COMPANY
3043 Olive Street St. Louis, Mo.

"WARNER GEARS—STANDARD FOR YEARS"

"It's an absolute impossibility to 'open up' a plant and immediately deliver efficient gear assemblies.

"It takes time and experience—especially experience—to enable a concern to ship really dependable parts.

"This is an undisputable fact, no matter what the business happens to be.

"We are surely capable, in lieu of these facts, as for thirteen years we have been manufacturing automobile gear parts for the most successful and best known motor car manufacturers in the country.

"And listen, what is more, we've been pleasing them in every particular.

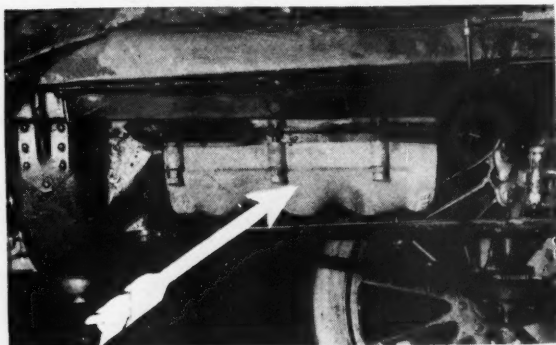
"Is there any better proof of a product's merit than one hundred per cent of satisfied customers?

"Looks as if we ought to be able to please you too."

**WARNER
GEAR
CO.
MUNCIE-IND.**

DETROIT OFFICE—628 FORD B'L'D'G.

The Gardner Auxiliary Engine Base for Ford Model "T" Car



The Gardner Auxiliary Engine Base makes all engine repairs possible without removing engine from car. This device is provided with cork gaskets, which makes it oil tight. Installed on car in from three to four hours. Shipping weight, 8 lbs. Price, \$10.00 f. o. b. Chicago.

The following repairs may be accomplished with the use of the Gardner Auxiliary Engine Base, viz.:

1. The Installation of New Piston Rings and Inspection of the Inside of Cylinders.

Remove Gardner Auxiliary Engine Base and cylinder heads. Unbolt connecting rods from crankshaft and push pistons and rods out through top of cylinders. Time required, **one hour.**

2. The Stopping of Knocks in the Engine.

Remove Gardner Auxiliary Engine Base, adjust the loose bearing and replace Auxiliary Engine Base. Time required, **fifteen minutes.**

3. The Replacing of Push Rod Bushings and Push Rods.

Remove Gardner Auxiliary Engine Base and radiator. Uncover gears in front of engine and draw out cam shaft. Drive worn bronze bushings down into base and new ones up into place from the inside. Replace parts removed. Time required, **two and one-half hours.**

4. The Rebrushing of Connecting Rods at Piston End. Same as Rule 1.

FOURTH YEAR ON THE MARKET

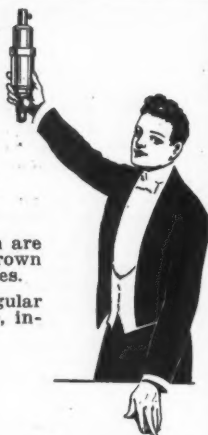
MANUFACTURED BY **The Gardner Engine Starter Co.**
1451, 1453 and 1455 Michigan Ave. CHICAGO, ILL.

Here's Long Life to Your Tires!

That's a toast that appeals to every automobilist. Tire troubles are the worst troubles you have with your car.

Do you know that three-fourths of them are due to under inflation? That's why the Brown Impulse Tire Pump means long life to tires.

The gauge, included as part of the regular equipment of every Brown Impulse Pump, insures exactly the right pressure.



The Brown Is the Handiest Pump to Use

Because it is the only pump of its kind that attaches and detaches without a wrench. The Brown Q. D. Spark Plug lifts out, the pump drops in. No wrench, no fuss, no trouble, no broken plugs.

A pump and air hose do not make a complete inflating outfit. You need a gauge. We furnish it. You should not struggle and break spark plugs in attaching your pump. The Brown Q. D. Spark Plug makes this unnecessary.

Price, complete, including plug, tire gauge and 12 feet of air hose.....	\$15.00
Extra Plugs	1.00
Previous models made over to fit the new connection	1.50

If you want to insure your comfort and economy this year, ask your dealer or write us about the Brown Inflating Outfit.

THE BROWN COMPANY
120 Bellevue, Syracuse, N. Y.

"Rist-Fit" — "Grip-Tite"
"Ventilated Back"—three
exclusive Grinnell features



Style 4020

Any one of these features puts Grinnell Motoring Gloves in a class by themselves. And all three assure you the finest and most distinctive gloves you can buy.

Grinnell Gloves

Sold with a Bond

are of the very highest quality. We have been making them for 58 years—of finest selected Reindeer and Coltskin—soft as velvet, wears like iron. They are washable in soap and water or gasoline—dry like new. And only in Grinnell Gloves do you get Grinnell "Rist-Fit," "Grip-Tite" and "Ventilated Back."

Ask your dealer for Grinnell Gloves. If he does not carry them, send us his name and your size. We will send your selection on approval. Handsomely illustrated booklet with samples of leather on request.

Morrison-Ricker Manufacturing Co.

(Established 1856)

San Francisco

64 Broad St., Grinnell, Iowa

Chicago

Newark

How You Can Help the LINCOLN HIGHWAY

"A continuous, improved highway from the Atlantic to the Pacific"

Do you want to be one of that great army of progressive patriots who are helping to build a greater, more beautiful and more prosperous America?

Do you want to join with a million other practical dreamers, in the pushing through of an unselfish work which means more business, more pleasure, more education and more advantages to all?

Do you want to help in the building of an eternal monument to the greatest name in the history of our country, to the greatest man the nineteenth century produced—Abraham Lincoln?

Do you wish to aid in the completion of the most practical enterprise ever undertaken by the American people? A 3400-mile link connecting the two oceans, to be used by, and directly profiting, sixty million of our population, and a source of inspiration to every community?

If you do, join the Lincoln Highway Association.

It's a great organization—a grand work to feel in sympathy with—costs but \$5.00, payable **once**. The price of one good dinner, of one ten cent cigar a week for a year, makes you a contributor and places your name on that vast list of patriots, which generations to come, will have cause to bless. Get out your check book **now**—here's a chance for you to build a portion of an eternal monument, the longest improved road in the world.

Send the five to

THE LINCOLN HIGHWAY ASSOCIATION
Dime Bank Bldg. DETROIT, MICH.

We have a set of Lincoln Highway pennants for your car, which will come to you for a dollar, prepaid.

A big map of the United States, showing the route of the Lincoln Way, is a fine thing to have on the wall of your office; it's backed with cloth, printed in three colors, and costs \$2.00. All the real Lincoln Highway boosters are wearing a little red, white and blue lapel button—they're twenty-five cents. Wear one.



Thermoid's efficiency remains until it is worn paper-thin and it contains as much material, and a half more than ordinary kinds.

Neither heat, oil, water, gasoline nor dirt affects it.

For more details see advertisements in Saturday Evening Post, Literary Digest, Life, Cosmopolitan, Review of Reviews and nearly all motor publications.

ASK YOUR JOBBER

Our Guarantee—Thermoid will make good, or we will.

Thermoid Rubber Company
Trenton, N. J.

NO MAN
IS
RICH
ENOUGH

to afford
a cheap
Plug in
his motor.
A poor
spark
requires
a richer
mixture
and more
gasoline.
Cheap
Plugs,
with their
cracking
Porcelains
or oil-
soaked
mica, lose
half the
current.



MILLIONS
ARE
SPENT
TO
ADVERTISE
PLUGS

The
millions
of de-
lighted
users
of the
HERZ
PLUG
are our
adver-
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Buy HERZ PLUGS

They will prove the best investment of your life, one that will bear rich interest in

Smaller Gasoline Bills

ASK YOUR DEALER

HERZ & CO., 245 W. 55th Street (Just off Broadway.) New York

The **AERMORE**
Exhaust Horn

\$5.50 Buys the **Ford Special**

Complete with all equipment for attaching to your car. No batteries, no wires, no ratchets, and no movable parts to wear and get out of order. Its first cost is final. It will outlast your car.

The tone is musical, and carries a block or a mile at the will of the driver. It is a pleasure to hear its beautiful signal. It doesn't cost much, and sounds like a \$25 horn. We make horns for all cars. Let us send you our catalog. Dealers, ask for our special free proposition.

The Fulton Company
724-726 National Ave., Milwaukee, Wis.

Starting - Lighting - Ignition

REMY

Apparatus & Organization of Constant Service

A FACT!
Equipment and Service Gives
Motor Cars Their

REPUTATION

REMY

"Standard of the World"

Starting - Lighting - Ignition

A Service Station in Every Motorina Center.

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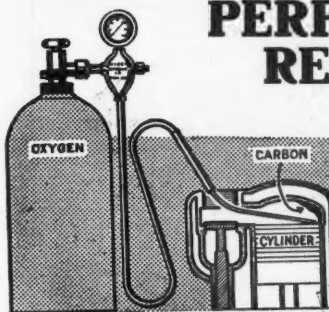
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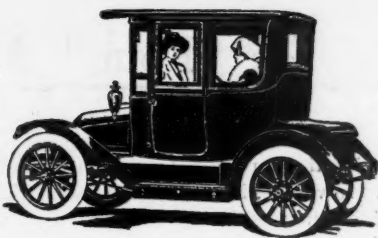
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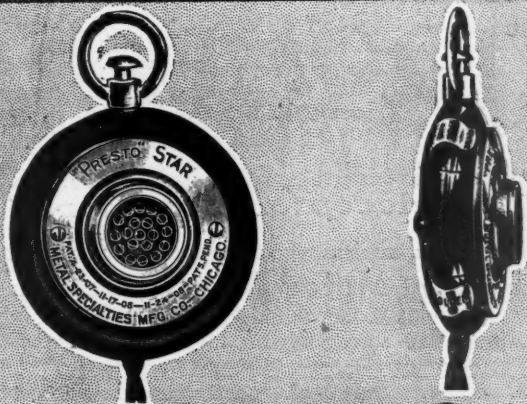
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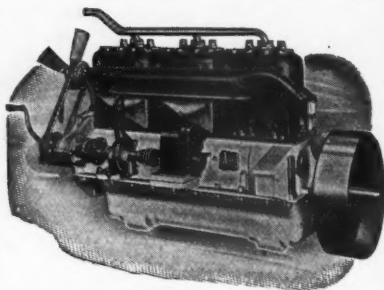
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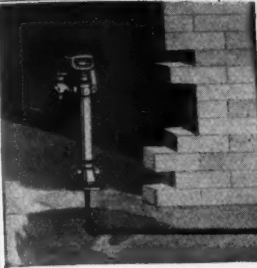
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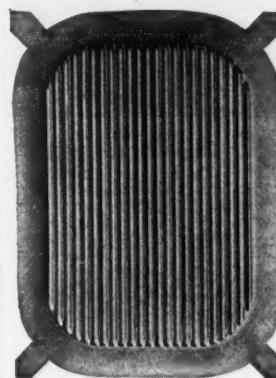
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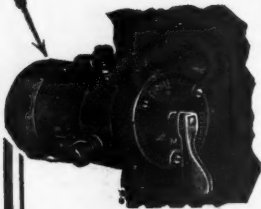
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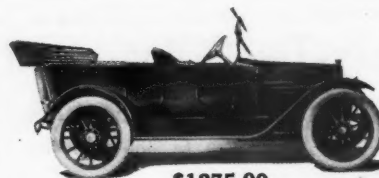
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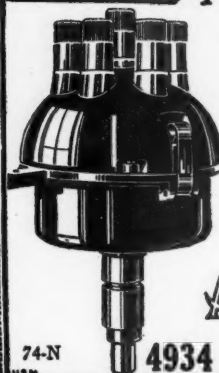
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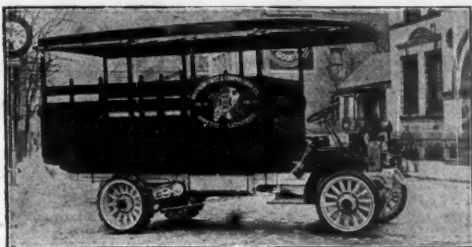
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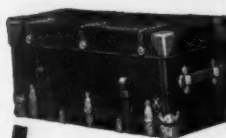
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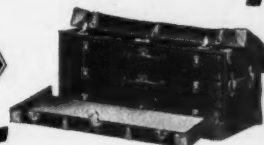
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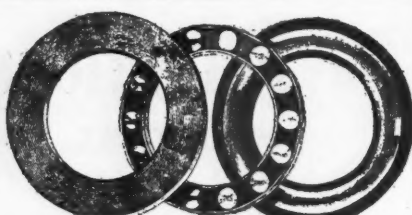
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You'll Love It

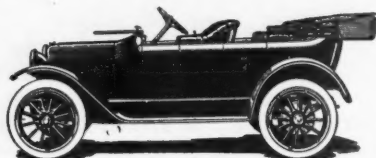
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Self cleaning—will outlast five sponges. Can't scratch or streak your varnish. Pays for itself many times over in the washing bills it saves you at the garage. Attaches to your garden hose. The Cataract never dribbles water down your arms and saves your back; no more continually bending over a bucket of dirty water. It's all brass, can't rust. It only costs \$1.00 with short handle—\$1.50 with long handle—\$2.00 with stop cock handle—the water being turned on or off right in the handle. Extra mops, 50c. At your dealer's or direct on receipt of price.

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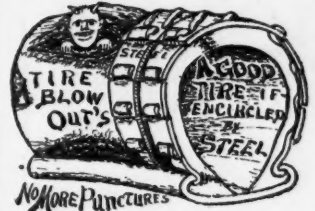
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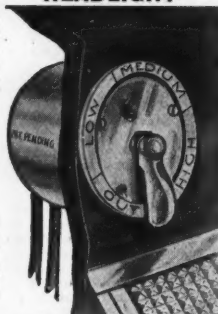
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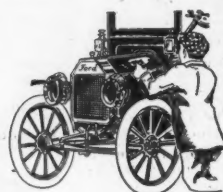
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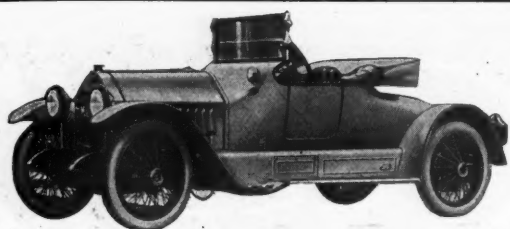
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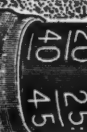
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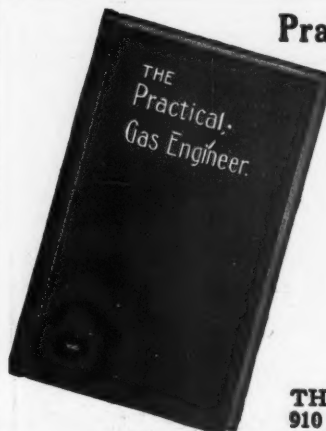
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Welding of all kinds of metals. Cast iron and aluminum a specialty.
525 W. Jackson Blvd. 111 N. Desplaines St.
Phones: Monroe 3937; Auto 36-192. Chicago, Ill.

AMERICAN WELDING CO.
2637 Michigan Ave., Chicago
Autogenous welding of all metals, such as crank cases, cylinders, etc. We positively guarantee all work. Tel. Calumet 3563.

AUTOGENEOUS WELDING
Expert welders on automobile parts. Manufacturers of the Galbraith Oxy. Acetylene Welding plants. Get our price and description of a complete welding plant used with oxygen and gas in tanks.
C. SORENSEN,
18 E. 16th St. Chicago, Ill.

BROKEN CRANKSHAFTS
Crankcases, cylinders, flywheels, gear-teeth, pistons perfectly welded and machined, ready to replace. Scored cylinders made new. Booklet.
ATLAS WELDING WORKS,
Rahway, N. J.

OXY-ACETYLENE WELDING
Cast Iron, Steel and Aluminum, etc. Cylinders, Crankcases and crankshafts a specialty. Engines, transmissions, etc., overhauled. Cylinders rebored with new piston and rings, \$7 up.
COMET MOTOR WORKS,
564 Jackson Blvd. Chicago

WELDING
Cylinder crankcase and crankshaft welded. Cylinders rebored, \$7 to \$11 a cylinder, including piston, 8 rings.
STERLING ENGINE COMPANY
331-333 S. Clinton Street Chicago, Ill.

WANTED AGENCIES

WANTED
State agencies for new patent automobile accessory. Sells to every automobile owner. Chance for live salesman to make money. Address Box 85, Muncie, Ind.

WANTED---AGENTS & SALESMEN

Exclusive and Side Line Salesmen
for spark plugs and accessories. Well established. Good chance for right man.
STURDY MFG. CO.
2637 Michigan Ave. Chicago

WANTED!
Live salesmen, exclusive territory, to introduce the American Gasoline Saver, a small device guaranteed to save 25% of gasoline. Retail at \$5.00—special price of \$2.25 each to hustlers. Every motorist will want one. Write to-day. Splendid side-line.

American Rubber Products Co.,
5625 South Boulevard, Austin, Chicago, Ill.

MISCELLANEOUS

We Are Constantly in Touch
with employers requiring High-Grade Engineering service. Are you listed with the
TOLEDO ENGINEERING AGENCY
Toledo, Ohio

BIDS WANTED

The City Council of Crystal Falls, Michigan, W. J. Gribble, City Clerk, will receive sealed bids until 5 o'clock P. M. Monday, May 18th, 1914, at the City Clerk's office, Crystal Falls, Michigan, for an Auto Fire Truck with a pumping engine on same. The said City Council reserves the right to accept any or to reject any and all bids presented.

W. J. GRIBBLE,
City Clerk.

STAMPINGS

Metal spinnings and stampings a specialty. All sorts of die work and metal patterns. Manufacturers of specialties and novelties. Experts in black enameling. We specialize in making up metal spinnings before dies are made, showing how stampings will look. Prices reasonable. Work guaranteed. Prompt delivery.

The Standard
Spinning & Stamping Co.,
TOLEDO, OHIO

Hoyt Electrical Instrument Works

Makers of

HOYT AMMETERS AND VOLTMETERS

Penacook,

New Hampshire

SUPPLIES

Dealers, send for our 1914 catalogue, just out. New goods, new prices, prompt shipments. A few Fisk casings, 36x4, Q. D. Clincher Heavy Car Type, at reduced prices, while they last.

CHICAGO AUTOMOBILE SUPPLY HOUSE
1355 S. Michigan Blvd., Chicago, Ill.



Greenslade Oil Co.

Main Office, Detroit, Mich.

Pacific Coast Agency,
Geo. L. and J. A. McPherson,
Portland, Oregon



SPROCKETS

Chains and Differential
IN STOCK OR ORDER

SEND FOR NEW CATALOG

CULLMAN WHEEL COMPANY
1341 Altgeld Street Chicago

The PARISH & BINGHAM COMPANY

PRESSED STEEL FRAMES

Write for Estimates

CLEVELAND, OHIO

MOTOR AGE

Classified Columns

The Trading Center of
the Motor Car Industry

MOTOR AGE is read once a week by more people who own, sell, handle or manufacture motor cars and accessories than any other publication in the country.

MOTOR AGE carries more Classified Advertising week in and week out than any other motor car publication. The cost is small, the chances for returns unexcelled.

An advertisement in MOTOR AGE
is 100 per cent efficient

The Clearing House—continued

Auction Auction Auction

American Motors Co.—Sold at Auction

We Bought PARTS, SUPPLIES and CARS

Vises, steel, 4" or 5" jaws	25	\$ 4.00	Inverted aluminum cones, asbestos faced	32	\$ 7.00	Elec. headlights.....	5	\$ 7.00 pr.
Oil, high grade cylinder	14 bbls.	.30 gal.	Lock washers.. 4,000,000		.15 C.	G. D. gas lamps.....	12	7.00 pr.
7-passenger bodies, unupholstered, in the white	42	25.00	Nuts, castellated.. 45,000		1.00 C.	Varnish	14 gal.	1.50 gal.
6-cylinder castings..	10	10.00	A. L. A. M. screws and bolts..... 7,000		1.00 C.	Tire covers.....	19	1.00
6-cylinder upper cases	35	10.00	Step bolts..... 5,700		.50 C.	Brace wrenches....	110	.75
Springs, rear.....	40	2.50	Ball thrusts.....	210	.50	Tires	24	8.00 ea.
6-cylinder crankshafts	8	15.00	Fan belts.....	62	.30	Hair for upholstering	1,650 lbs.	.25 lb.
4-cylinder motors..	9	100.00	Ampmeters	92	.80	Leather asst.	400 ft.	.25 ft.
6-cylinder motors..	10	200.00	Kick switches	173	.75	Mohair, reg. \$1.50..	596 yds.	1.00 yd.
Flywheels machined and finished for above motors....	98	3.00	Pressure gauges..	87	1.25	Roadster bodies, upholstered with tank, less cushions	2	50.00
4-cylinder crankshafts, machined..	30	20.00	D-5 Rayfield carburetors	6	11.00	Runabout bodies, not upholstered..	17	10.00
Connecting rods, rough	328	.75	H-2 Rayfield carburetors	41	11.00	Coupe bodies, upholstered	3	175.00
Pistons, finished..	165	2.00	D-5 Rayfield carburetors	52	11.00	Spring clips.....	1,650	.15
4-cylinder exhaust manifolds	61	1.00 ea.	H-2 Rayfield carburetors	14	11.00	Second-hand tops..	7	15.00
Bronze bushings, stock all sizes....	1,550 lbs.	.30 lb.	Aluminum heel plates	154	.75	Gray roadster bodies complete..	15	50.00
4-cyl. aluminum cases	26	16.00	Aluminum running-board molding....	760 lb.	.10 ft.	Upholstered and painted 4-passenger bodies.....	21	100.00
Upholstered leather cushions, fronts..	7	3.00	Cocoa mats, 34x38..	54	1.75	Limousine body, painted and upholstered	1	500.00
Rears	7	4.50	Nickel grease cups, 1/8"	3,515	.12	Radiators, nickel plated	14	25.00
16" brake drums, machined	11	2.00	Push switches.....	100	.15	Transmissions, 3 and 4 speed....	15	.50 ea.
2 x 1/4" brake band lining	700 ft.	.15 ft.	Hose clamps, all sizes	638	.07	Oval tanks with double compartment	51	6.00 ea.
Eisemann magnetos, 4 and 6 cyl..	8	25.00	Spring bolts with grease cups.....	432	.20	38x4 1/2 Firestone demountable rims..	497	2.00 ea.
Elec. tail lamps....	116	1.00	Long lever prim. cups	174	.15	New wheels, 38x4 1/2 with rims	20	4.00 ea.
1/4" ball and socket joints	746	.08 ea.	Trans. lever sets... 30		7.50	4-cylinder runabout, American underslung, guaranteed in fine condition..	1	625.00
Boxes Woodruff keys, assorted, 50 to the box.....	125	1.00	Mufflers	28	3.00	Red four-passenger car, 50 H.P., completely equipped	1	925.00
Hard rubber handles for starting cranks	127	.10 ea.	Differential gears, all models	33	8.00	American Traveler, 4 cyl., 50 H.P....	1	650.00
Nickel steering tubes for steering gears	13	2.00	Storage batteries, slightly used....	50	8.00			
			Air pump for starter	27	15.00			
			Starting switches..	13	1.00			
			Air tanks.....	44	2.00			
			Electra starters... 50		50.00			
			Auto Lighters..... 2		15.00			

The above parts are all from the American Motors Co. and we have thousands of parts not mentioned. If you have one of these cars, send us your name and address for repair parts.

AUTO PARTS COMPANY

737-39 Jackson Boulevard

: : : :

CHICAGO

Classified Advertising

Rate 25¢ a Line

Cars For Sale

A BARGAIN—UNUSED FOUR CYLINDER ton and a half truck held by bank. Will sell for \$1,200.00 cash. Address Union National Bank, Muncie, Ind.

MARMON 32—1914 BRAND NEW CAR. Full equipment, power tire pump. A bargain. Box 38, Bedford, Ind.

MODEL F 7-PASSENGER STODDARD—Dayton. Perfect condition except tires. \$450. A guaranteed bargain. F. E. Alford, Goshen, Ind.

RACE CAR 281 CUBIC INCH. 85 MILES per hour. Cheap, cash or time. Sheridan, 3306 Park Ave. Indianapolis, Ind.

20-25 H. P. ROADSTER CHASSIS; SHAFT drive tubular front axle, 1/2 elliptic front springs, full elliptic rear springs, transmission, 30x3 wheels, fenders and all parts to build frame, \$35.00. J. M. Herschlet, Appleton, Wis.

Parts and Accessories

WANTED

WANTED TO BUY A GOOD 4 CYL. OR 6 cyl. gasoline motor. Greer College of Motoring, 1456 S. Wabash Ave., Chicago.

WANTED TO BUY A SEVEN PASSENGER or more bodies, or limousine new or second hand, and some three passenger seats. Merritt & Wills, San Marcos, Texas.

For Sale or Exchange

FOR EXCHANGE OR SALE
A fully equipped garage in a live city of twelve thousand people. Does business twelve months in the year. Will consider stock merchandise, houses or business property. Price, \$9,000. Homer W. Wright, Sullivan, Illinois.

Help Wanted

AUTO SUPPLY AND ACCESSORY JOBBER in South will employ at once traveling representative. Permanent position to right man. Salary and commission. Give references from former employers. Address Box E 94, c/o Motor Age.

WANTED—ALL AROUND REPAIR MAN. Must understand electric starters. Prefer married man; must be sober; no cigarette smoking. A good man can have steady work. Will pay good wages. Write Box 446, Galva, Ill.

WANTED—ONE OR TWO BANG-UP GOOD automobile salesmen. Must already have made good and carry a good record. Have a splendid proposition for a live wire for Chicago. Give full details and references in replying. Strictly confidential. Address Box E 93, c/o Motor Age.

WANTED—THERE IS AN OPPORTUNITY in the sales force of a prominent automobile company for one or two highly efficient wholesale salesmen. Only men of the highest class, experience and producing qualities are desired. Address Box E 99, c/o Motor Age.

WANTED—TWO SALESMEN CALLING on Auto Accessory Jobbers in East and West, to handle, on commission, Electric Tail Lamp, as a side line. Address, Box E 105, c/o Motor Age.

WANTED—A GOOD, HONEST, RELIABLE boy past age of 16 years to drive Overland and Ford cars, also help in office and take care of other cars in garage in small country town. Clyde C. Hessman, Buffalo Prairie, Ill.

Situations Wanted

MECHANIC WITH SPECIALTY SALES experience, touring west and south in auto, is open for advertising or selling proposition. Bangs, Coldwater, Mich.

WANTED—POSITION AS DRIVER FOR private family or tourists. Have had six years experience; four years on road and two in shop. Can run and repair any make of car. Good habits; can furnish best of reference. Address, Box E 106, c/o Motor Age.

WANTED POSITION—WORKING FOREMAN. The man for Taxicab service or building up new garage. Twenty years' experience. Sober, quick, accurate workman. Address, Box E 102, c/o Motor Age.

Business Opportunities

AUTOMOBILE SERVICE AND REPAIR station. Fully equipped as to machinery and tools; 6,500 sq. ft. floor space, entire ground floor (no elevators), 2 blocks west of Broadway in the heart of the automobile district. Business 7 years established. Credit A1; present lease 5 years to run. Entire business for sale at attractive figure. Strict investigation invited. Address Box E 98, c/o Motor Age.

FOR SALE—GARAGE AND COMPLETELY equipped machine shop, building, ground and tools, for \$3,400; no trades. For particulars write Jos. Slagel, Fairbury, Ill.

FOR SALE—FIRST CLASS GARAGE AND accessory store located in a live town in the Sunny South; doing good business every day of the year. Have agency for the Ford, Paige and Chalmers. Best three sellers in the United States. Sold 70 Fords last year. Have better prospects this year. An investment of \$3,000.00 will earn three to five thousand per year net. Full investigation permitted. Address Box E 77, c/o Motor Age.

FOR SALE—ONE OF THE BEST LOCATIONS for Garage and Sales Room in Ohio. Building two story, 175x45, over 15,000 sq. ft. of floor space. Ford Agency, large Auto Livery and Accessory business; no better opportunity ever offered. Address Box E 101, c/o Motor Age, Chicago, Ill.

HAVE A GOOD PROPOSITION TO OFFER to some Automobile Manufacturer needing more room or additional capital and willing to move. Write promptly, giving details of your requirements and present business. Box E 104, c/o Motor Age.

WANTED—MANAGER AND TREASURER who has some capital to invest in a company now being formed for reclaiming rubber and making mechanical rubber products. Great opportunity. American Rubber Products Co., 5625 South Blvd., Austin, Chicago, Ill.

WANTED—MECHANICS THAT CAN INVEST \$20,000 in a strictly first class manufacturing plant building a line of commercial wagons and auto trucks. A co-operative company is desired. Business is well established and orders ahead. Only high class mechanics wanted. Address Box E 100, c/o Motor Age.

WE HAVE AN OPENING FOR A COMPETENT factory manager in moderate sized plant making medium priced automobiles. One having some capital to invest preferred. Address, Box E 103, c/o Motor Age.

Miscellaneous

LOW RENT ON AUTO ROW, CHICAGO. Will sublet cheap, all or part 1,500 ft., second floor; new, high-class building. Advertising privileges, large front plate glass window facing Michigan Blvd. Also private office or desk space. Tanner Mfg. Company, 2011 Michigan Blvd.

WANTED—THE ADVERTISEMENTS OF those men who believe in themselves and their ability to "do something." If you are a salesman, demonstrator or repairman for motor cars—a man of ability—and desire to make a change, it will pay you well to insert an ad under "Situations Wanted" on this page. Mr. Employer, if you want a good man, it will pay you to watch these columns.

MOTOR AGE is read by more than 23,000 owners of motor cars, garages and repair shops, motor car dealers, etc., **every week**. These people read MOTOR AGE **every week** because they are intensely interested in motor cars—they read it to keep in touch with "what's what and who's who" in motordom. Do these 23,000 and more people read the **Classified Advertisements**? Please note the following:

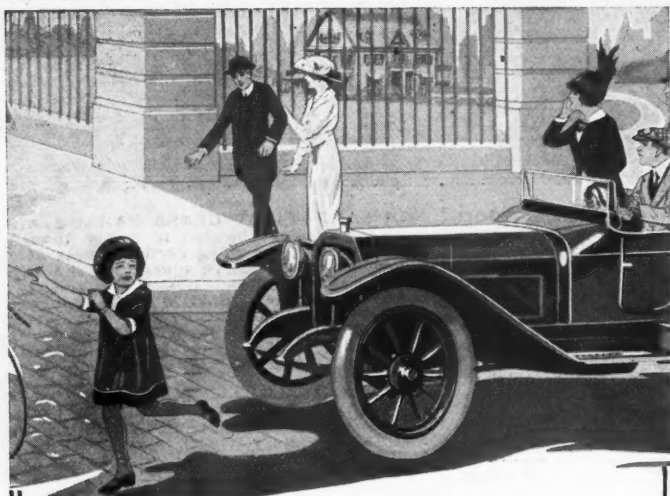
Business Opportunity

YOU WILL PLEASE CANCEL OUR ORDER for classified ad of the 29th. The two insertions were enough. We sold the plant today, and MOTOR AGE did it. We ran the ad in four other publications and did not get as many inquiries from all four as we got from MOTOR AGE, and we are still getting replies.

Situation Wanted

KINDLY CHANGE MY ADDRESS FROM Odebolt, Iowa, to Jonesboro, Ark. It is a good thing for me that I did not have you run my ad for six weeks, as the two insertions got replies enough so I thought I would be broke buying postage to answer them. Have a good job here, obtained through the ad.

Can anything be more convincing that classified advertising in MOTOR AGE Pays?



At Critical Moments Like This

TRADE MARK
Raybestos
REG. U.S. PAT. OFF.

Grips and Holds the Brakes

When an accident can be averted only by the quick, unfailing action of your brakes—it is reassuring to depend upon the **guaranteed** brake lining.

If your brakes are lined with Raybestos, you don't have to guess about its reliability. You **know** that it will grip and hold—because its wearing quality is definitely guaranteed.

The Raybestos Guarantee

If Raybestos fails to last one full year from the date it is placed on the car, we will furnish new lining without charge. This guarantee applies to all types and weights of pleasure cars and to all light trucks.

Use Raybestos and be safe. Look for the name and the silver edges.

THE ROYAL EQUIPMENT CO.
1352 Bostwick Ave. BRIDGEPORT, CONN.

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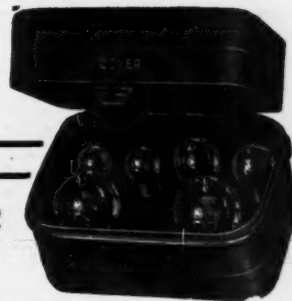
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S

Z

Pat. applied for.

ELECTRIC
LIGHTBULB
CASEONE OF THE MANY GOOD THINGS IN THE
LINE OF

Dover Auto Specialties

is the
New Dover Electric Light Bulb Case

It will carry extra bulbs safer than the ones in the lamps of the car. Made of extra heavy seamless steel—all other parts Electric Welded. No rivets or solder used in the construction.

The bulbs are securely held in place by a new brass spring locking device, which gives absolute protection against rough handling and vibration.

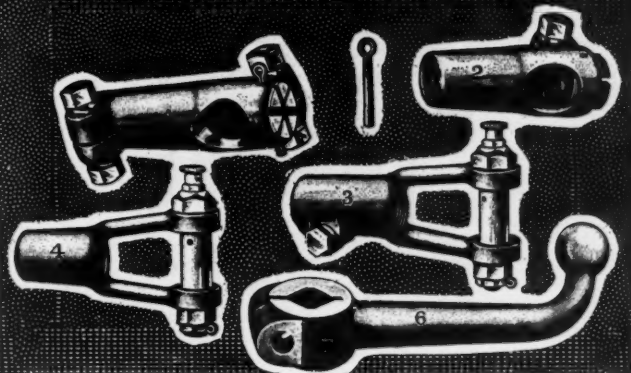
A new bulb always ready in perfect condition when needed.

Do not confuse our heavy seamless steel case with the cheap pasteboard or wood boxes, which are quickly ruined by moisture or rough handling and are only fit for keeping bulbs on the shelf in a store.

Send for New Catalog of Over 235 Dover Auto Specialties

DOVER STAMPING & MFG. COMPANY
CAMBRIDGE, MASS.

BILLINGS & SPENCER AUTOMOBILE STEERING CONNECTIONS



Automobile Steering Connectors Are Highly Important Parts and Should Be Obtained From Highly Reliable Manufacturers

BILLINGS & SPENCER have for several seasons made a complete line of these parts and made them of material carefully selected for the purpose. They are correct in construction, and machined and inspected with great care.

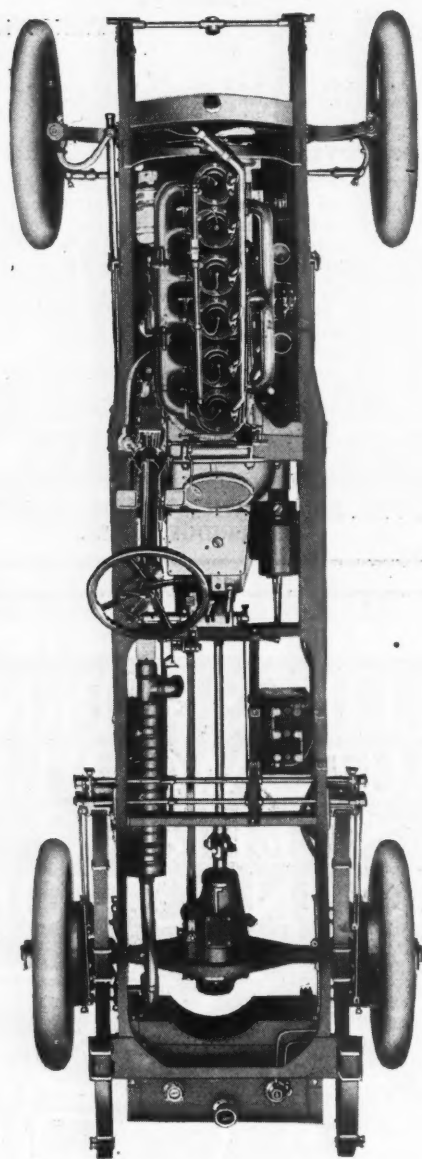
Besides, by our large production of this kind of parts, makes it possible for us to care for your requirements with the greatest facility and business advantage.

THE BILLINGS & SPENCER CO.

Hartford, Conn.

When Writing to Advertisers, Please Mention Motor Age.

Strength and Inbuilt Efficiency



Plan view Stearns-Knight Six-Cylinder Chassis

THE wonderful smoothness and efficiency of the sleeve-valve motor, added to the unquestioned sturdiness of the Stearns chassis, have produced in the

Stearns

a car which is unequalled in any essential feature of motor car construction. The new series models offer all that could be asked in appearance, riding comfort, flexibility and ease of control. Efficiency and dependability are inbuilt.

Sixteen Models—\$3750 to \$6200
Four and Six Cylinders

THE F. B. STEARNS COMPANY
Cleveland, Ohio

Overland



One corner of the Overland aluminum foundry

Small picture shows a few finished aluminum castings

Over 6.5% of America's Supply of Aluminum is used in Overland Cars

MORE than 6.5% of all the aluminum consumed in America during 1913 was used in the manufacture of Overland cars. The whole country consumed about 73,000,000 pounds, for all purposes. Overland cars used 4,750,000 pounds of this total.

We use more aluminum than any other single consumer in the world. Twelve and one-half tons, or 25,000 pounds is being used every working day right now.

Where the Overland employs aluminum, the ordinary car, which is produced in small quantities, utilizes cast iron. While aluminum costs about 28 cents per pound, it

weighs only 164 pounds per cubic foot. Cast iron, which costs only 3 cents per pound weighs 450 pounds per cubic foot.

Therefore, we pay \$46.92 per cubic foot for aluminum while those makers who use cast iron pay only \$13.50 per cubic foot—but we eliminate 286 pounds of weight per cubic foot. And the light car is the *economical* car, both in tire wear and fuel consumption. Overland *material* costs us more, but Overland *operation* costs the owner less.

And, because we manufacture cars in 50,000 lots, the original cost of the Overland is 30% less than other cars of like specifications. We purchase materials, manufacture parts and market cars in large quantities—and the buyer profits.

Write today for catalogues and descriptive literature. Please address Dept. 46.

\$950

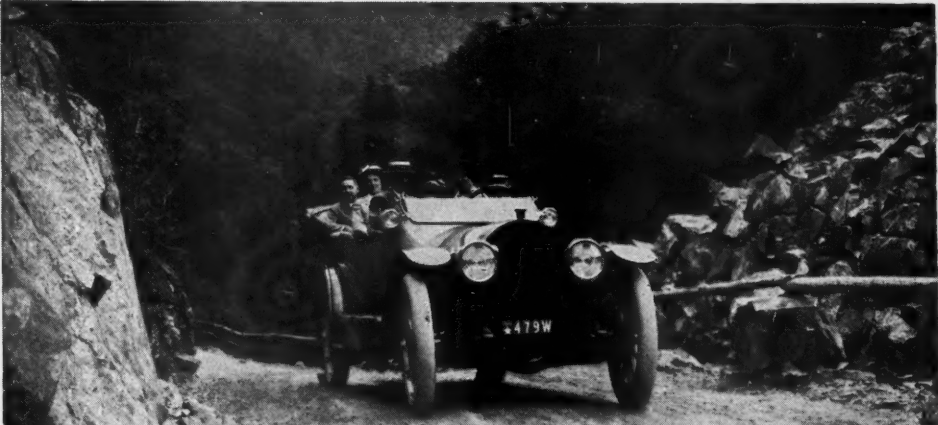
Completely equipped
f. o. b.
Toledo, Ohio

The Willys-Overland Company
Toledo, Ohio

Manufacturers of the famous Overland Delivery Wagons, Garford and Willys-Utility Trucks. Full information on request.

\$1075

With electric starter
and generator, f. o. b.
Toledo, Ohio



5,918,000 gallons sold last year
1,536,232 gallons more than 1912

Polarine
FRICTION REDUCING MOTOR OIL

Maintains the correct lubricating body at any motor speed or temperature. Lubricates all makes of gasoline motors.

The constantly increasing use of POLARINE by thousands of motorists, is indisputable proof of its being the correct oil for all makes and types of motor cars, motor trucks and motor boats.



STANDARD OIL COMPANY

(AN INDIANA CORPORATION)

Makers of Lubricating Oils for Leading
Engineering and Industrial Works
of the World
(200)

